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A HANDBOOK OF THERAPEUTICS

A HANDBOOK

OF

THERAPEUTICS

BY

SYDNEY RINGER, M.D., F.R.S.

HOLME PROFESSOR OF CLINICAL MEDICINE, UNIVERSITY COLLEGE; PHYSICIAN TO UNIVERSITY COLLEGE HOSPITAL

AND

HARRINGTON SAINSBURY, M.D., F.R.C.P.

PHYSICIAN TO THE ROYAL FREE HOSPITAL, AND THE CITY OF LONDON HOSPITAL FOR DISEASES OF THE CHEST, VICTORIA PARK

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THIRTEENTH EDITION

NEW YORK
WILLIAM WOOD AND COMPANY
1897
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PREFACE TO THE THIRTEENTH EDITION

In this edition, as in those which have preceded it, the indications for the use of drugs in disease are dwelt on rather than the physiological action. The book is, in fact, a work on Clinical Therapeutics.

A long interval having elapsed since the last edition, the list of new drugs and of new methods to be considered has been proportionately great, and the difficulty has been to select the tried from the untried. The endeavour has been made to do this however, and at the same time every portion of the work has been carefully revised. On the new departure, Serum Therapeutics, a separate chapter has been introduced, and in connection with the Invalid Dietary a short section upon the use of the digestive ferments. In the earlier part of the work a brief reference is made to the Nauheim (Schott) treatment. The index must be consulted for other additions and changes.

For the rest, this, the Thirteenth Edition, continues on the same lines as preceding editions, and essentially and above all in its endeavour to make clinical considerations indicate or contra-indicate the employment of remedies.

The name of Dr. George Bird has been so long associated with previous editions of this book, that it is a great pleasure to continue this association, and to thank him again for the help which his assistance in the past has rendered in the preparation of this edition also.

London, *August*, 1897.

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THERAPEUTICS

INTRODUCTION

I HAVE thought it might prove useful to the student and to the young practitioner to insert here a brief account of the symptoms of disease. Of late years, since attention has been more drawn to the significance of physical signs, too little heed seems to me to be paid to the detection and appreciation of symptoms, objective and subjective. This constitutes a marked defect among students. One often meets with a student, thoroughly equipped with all the resources pertaining to physical diagnosis, who yet is sorely puzzled by the indications afforded by the pulse or tongue. The reason is obvious. Physical signs are soon learned, whilst it requires a longer time, more patience, and a more discriminating observation to appreciate the meaning and to estimate the value of symptoms.

The indications of disease are divided into symptoms and physical signs. The direct information to be obtained from the pulse, the skin, the tongue, the breathing, the evacuations, etc., are, for convenience, termed objective symptoms. The indirect information we gather from the patient's description of his own feelings and sensations, which are recognised only by the patient himself, these, likewise for convenience, are termed subjective symptoms. Important though physical signs undoubtedly are, yet symptoms, especially objective symptoms, are far more valuable. Physical signs, as a rule, help us to detect only coarse and decided changes, and are chiefly useful in diagnosis, but symptoms are far more useful guides in prognosis and in treatment, for by telling us, as they do, how the system has responded to the disease, which we have localized by physical signs, they enable us more accurately to gauge the powers of this same system.

It may be said, that before we can efficiently treat a patient, we must first form a correct diagnosis; hence physical signs, by greatly assisting us in this respect, must likewise greatly aid in the treatment. In some measure, this proposition is no doubt true; but when we have accurately diagnosed the disease, we treat, in most cases, the secondary effects rather than the primary disease, and these secondary effects generally make themselves apparent as symptoms. Only ir few instances, such as ague and syphilis, can we directly attack the disease itself: in other instances we must be content to combat the secondary and often fatal effects.[1] A disease, in many cases, neither endangers nor destroys life by its direct effect on the organ attacked, but through a secondary effect manifested on another organ or organs. Thus to take the case of pneumonia; here, by no means unfrequently, the dangers depend, not on the condition of the lung, but on nervous or cardiac depression. The fever depresses the nervous system, producing sleeplessness and delirium, and this depressed state of the nervous system causes cardiac weakness and so endangers or destroys life; or the fever may directly depress the heart and so weaken it that the patient dies. Now in both of these instances the effects on the nervous system and on the heart are manifested mainly by symptoms, and without due appreciation of, and proper attention to these, so much the worse will it be for the patient.

Instances like this might be multiplied to any extent. Moreover, there is the wide range of diseases in which physical diagnosis is unavailing, and where there are only symptoms to guide our treatment, and unless trained in the recognition and estimation of symptoms, these are just the cases in which the young practitioner will be most likely to find himself at sea.

THE TONGUE

We examine the tongue to ascertain whether it is clean or furred; dry or moist; to note its colour, etc.

What is the meaning of a furred tongue?

A tongue may be furred from febrile disease; from local causes; from sympathy with the stomach, intestines, or liver.

The condition of the tongue in fever is, perhaps, more a help in prognosis than in treatment. In most fevers the tongue is at first covered with a moist fur, but in some cases, strange to say, it remains quite clean. Sometimes this is the case in typhoid fever. Now the coated tongue in fever does not give us much suggestion with regard to treatment, for whether the tongue is clean or foul, if there is constipation the bowels must be relieved; if the tongue is very foul—that is, thickly coated—a mercurial purge will be found best;[2] whilst the fever continues, however, some fur usually remains.

Local causes often foul the tongue. Enlarged tonsils often coat the back of the tongue. Decayed teeth often fur a portion of the tongue. If one tonsil only is enlarged, or if the decayed teeth are situated on one side, then only the adjacent portions of the tongue will be furred. In neuralgia of the fifth, when the lower branches are affected, the tongue on the neuralgic side is apt to become furred.

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[1] In serum therapeutics we have promise of a wider application of direct treatment.

[2] Before administering a purgative in fever we must, of course, exclude the presence of any local condition of the alimentary tract, which, itself, would contra-indicate such treatment, as, for instance, in typhoid fever associated with constipation, or in typhlitis and perityphlitis, etc.

Excessive smoking almost always furs the tongue.

The tongue very frequently indicates derangement of the stomach, bowels, or liver, and thus, if there is no fever and no local cause —such as enlarged tonsils, bad teeth, etc.—a coated tongue will indicate some disturbance of the primæ viæ.

What does a coated tongue under these circumstances indicate? We shall rarely go wrong in taking this furred tongue as an indication for giving one of four medicines, or some of them combined, namely, mercury, podophyllin, tincture of nux vomica, and nitric acid.

How are we to determine which to give, and its dose? If there is constipation, then we should give a mercurial preparation or resin of podophyllin in purgative doses. Any purgative, it is true, will here be useful, and especially the natural purgative waters of Püllna, Friedrichshall, or Carlsbad; but these, though valuable remedies, are in many instances inferior, in the cases in question, to mercurial and podophyllin purges.[1]

As regards mercury, our choice falls either on calomel or blue pill for adults, or on calomel or grey powder for children. The calomel or blue pill should be combined with extract of belladonna or of hyoscyamus, since this addition obviates the griping, and certainly seems to enhance the action of these drugs. An effective dose is half a grain of calomel with three grains of extract of hyoscyamus, for three consecutive nights; the first pill generally purges pretty freely, the second much less freely, and the third scarcely at all, though it still helps to clean the tongue.

Which should we choose, mercurial purges or podophyllin resin? The answer to this question depends on the colour of the stool. If the motions are too light-coloured, mercurial purges are best; if, on the other hand, the motions are too dark, then podophyllin is needed. For this clinical fact I can give no explanation.

What is to be done when the bowels are freely open, or have been relaxed by medicine, but the tongue still continues furred? Such cases we meet with often in gastric, biliary, or intestinal disturbance; sometimes also in early convalescence from acute illness the tongue does not clean so quickly as it should, a sure sign of impaired digestion. Here again a mercurial or podophyllin preparation will be found useful, in association with a course of tincture of nux vomica and nitric acid. If the motions are too light, then a third or half a grain of grey powder may be given night and morning, or three times a day; if the motions are too dark, then it should be a small dose, say a thirtieth to a twentieth of a grain of podophyllin resin, night and morning. Five drops each of the tincture of nux vomica and dilute nitric acid thrice daily before meals, will much promote the action of the mercury or the podophyllin.

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[1] It may be well to combine the action of the saline with that of the mercury or podophyllin, giving the latter over-night, the former early the next morning.

Sometimes the coating of the tongue is dirty or brown, and the patient complains of a disagreeable bitter taste, especially in the morning; this symptom is an additional indication for the foregoing treatment. Sometimes, in spite of treatment, the disagreeable bitter taste persists in the morning, or even during the greater part of the day. Rinsing the mouth with a weak solution of permanganate of potash will generally for the time being remove the annoyance.

As the tongue cleans the fur recedes from the tip and edges, and gradually becomes thinner, especially at its margins. With a little practice we can generally detect when the cleaning process is going on.

After an acute illness like typhoid fever the tongue sometimes parts with its fur in flakes, leaving clear smooth patches, especially towards the back. This tongue denotes a slow convalescence. In typhoid fever this tongue may a second time become dry, with a return of the abdominal symptoms. In a case such as this turpentine is indicated in 10 to 20 minim doses every two or three hours.

A dry tongue occurs most frequently in fever. The dryness first invades the tip and extends up the centre, spreading meanwhile laterally, till the whole tongue becomes dry. It grows moist in the inverse order of its invasion. A dry tongue generally indicates nervous depression, often shown besides by delirium, usually of a low muttering kind. This nervous prostration is often dependent on want of sleep. Narcotics, therefore, *e.g.* chloral, bromide of potassium, or opium, by inducing sleep, soothe and strengthen the nervous system, and indirectly moisten the tongue. Opium is often more useful than bromide of potassium or chloral, for opium appears to have a greater effect on the tongue than either of the other drugs, inducing, perhaps, a moist condition by a direct action on the tongue and stomach, as well as by its sleep-producing effect on the nervous system.

Being frequently a sign of nervous depression, the dry tongue becomes also an indication for giving alcoholic stimulants. If, however, the nervous depression is due to wakefulness, it is better, if possible, to secure refreshing sleep by a soporific, which, by soothing and strengthening the nervous system, renders the tongue moist, promotes digestion and assimilation, and incites the patient to take more food. The two chief uses of alcohol are to assist digestion and to sustain the nervous system. Now sleep is the best restorative, and hence fever patients who sleep well do not as a rule require stimulants.

If sleep cannot be secured, or if in spite of sleep the tongue remains dry and the delirium persists, then alcohol is indicated, though the pulse is a still better guide to its administration. Usually, however, a patient with a dry tongue will have this other and better indication in the form of a frequent, quick, and compressible pulse.

Whilst the tongue often affords evidence of the necessity for alcohol, it sometimes shows when it does harm, for if the tongue grows coated or drier under its use, it is evident that the stimulant is doing mischief.

The tongue in an aged person more readily becomes dry, even in non-febrile illnesses, hence in such patient a dry tongue has not quite the same serious import as a dry tongue in a younger person. In sleeplessness of the aged we shall accordingly have to be more careful how we give soporifics, for though in many cases a soporific is very beneficial, yet in old people it sometimes produces great excitement. Again, when the dry tongue is associated with depression or exhaustion, we not infrequently find that alcohol increases the dryness and destroys the appetite, and especially in the case of aged patients, stimulants require to be given in small quantities at first, and the effect carefully watched.

The colour of the tongue is a useful sign. A broad, pale, flabby, tooth-indented tongue indicates anæmia with a relaxed condition of the tissues. It is met with in simple anæmia, and chlorosis, and in some chronic diseases, as in Bright's disease, in which, in addition to anæmia, there is hydræmia—an excess of water in the blood. This tongue always signifies the need for iron, and in cases of anæmia the astringent preparations in large doses will be found, as a rule, by far the best.

A swollen, tooth-indented tongue during a course of mercury is one of the earliest signs of salivation.

In diabetes, in severe and advanced cases, the tongue is often characteristic. It becomes smooth, glazed, shiny, beefy-looking, abnormally clean, often with a tendency to become dry, and sometimes quite dry.

The tongue may be red, with prominent red papillæ most marked at the tip; this red tongue, too clean, too smooth, or only slightly furred, is named "the irritable tongue," and it points to an irritable state of the alimentary tract. It is met with in certain dyspeptic cases, sometimes in drunkards, and especially in phthisis when the intestines are ulcerated or when there is tubercular peritonitis. Small doses of arsenic, say one minim of the official liquor, given shortly before food, will generally improve this tongue and the associated conditions. It should be borne in mind that great irritation of the stomach or intestines may exist, or even tubercular peritonitis, unaccompanied by this irritable tongue.

In scarlet fever, a few days after the commencement and before the fever declines, this tongue is met with, and it continues during the early part of convalescence. It is the very characteristic "strawberry tongue," always suggestive of scarlet fever. Its appearance arises from desquamation of the tongue, for the cuticle of the tongue being moist is more easily separated than the cuticle of the skin, hence the tongue desquamates some days before the skin. I need hardly say, that whilst the fever lasts, we should not treat this tongue with arsenic, though, if convalescence is tedious and the tongue retains its strawberry character, arsenic and nitric acid will be found useful.

The "nervous tongue" is also very noteworthy: generally it is very slightly coated and covered with a slight froth, most marked close to the edges. We meet with it in persons of nervous temperament, especially during the period of excitement, and in cases where the nervous system has been depressed by overwork and worry.

These, as instances of the more important morbid appearances of the tongue, may suffice.

THE PULSE

With each contraction of the heart, a wave is sent through the arterial system, which, in its journey along the vessels, distends them; this periodical distension, readily felt when the fingers are placed on an artery, is the pulse. Sir W. Broadbent denies that the pulse is due to distension of the artery, and ascribes it to the wave forcing or trying to force the vessel, flattened by pressure of the finger, back to its cylindrical form. The pulse, in any case, depends on the heart, and varies with the condition of the heart. It is influenced also by the condition of the vessels, the pulse varying according to the contracted or dilated condition of the arteries, and the intra-vascular tension or blood pressure, intimately associated with these states; moreover, it is also modified when the walls of the vessels become fibrous or calcareous. The pulse is an accurate index of the condition of the heart, and is among the most valuable guides in disease of this organ.

The importance of the pulse is manifest when we consider that disease kills, ultimately, by arresting the heart. Whilst the heart beats there is life and hope. In many instances the pulse gives the promptest sign of danger and the earliest indications for treatment. To illustrate this by an example, take the case of pneumonia, in which disease so long as the pulse continues good we have fair hopes of our patient. In some patients the heart fails early, and the pulse soon reveals this condition; the patient fails, we say, at the heart. In other instances, the nervous system first gives way, as shown by sleeplessness and muttering delirium; but though these symptoms cause anxiety, yet so long as the pulse remains good we hope to save our patient. The anxiety, indeed, which we feel with regard to this nervous perturbation arises from its depressing effect on the heart; for if the patient does not sleep, the unrest, with the consequent delirium, rapidly depresses and weakens the patient, and at last arrests the heart. The disease, therefore, may directly tell on the heart, or it may indirectly affect this organ by its depressing effect on another system. In any case it is the ultimate effect of the disease on the heart that destroys life. It is hardly possible, therefore, to over-estimate the cardinal importance of the pulse.

The pulse-beats may be frequent or infrequent; slow or quick; small or large; compressible or incompressible; regular, irregular, or intermittent.

By the *frequency* of the pulse we mean the number of beats in a given time.

By a *quick* pulse, that each beat occupies less than the usual time—*i.e.*, that each wave is of shorter duration relatively to the pause between the waves. The terms *short* and *long* are preferable to *quick* and *slow*, being less ambiguous. The qualities here spoken of have reference to each individual beat independently of its serial relationship.

When the volume of the pulse is greater than usual, it is said to be *large*; when less than usual, it is said to be *small*.

When the fingers can easily stop the pulse, it is said to be *compressible*; when, on the other hand, it can be arrested only with difficulty, the pulse is said to be *incompressible*.

The pulse may be irregular or intermittent. In an *irregular* pulse, succeeding beats may differ in length, force, and character, but the chief difference lies in the varying length of the intervals between the beats. In an *intermittent* pulse a beat is from time to time lost. The *recurrent* pulse is explained at the end of this chapter.

The frequency of the healthy pulse varies: thus, in some persons the normal pulse rate is 100, in others it falls as low as 50 in the minute, but these extremes are rare.

Five conditions of common occurrence produce a frequent pulse: excitement, hysteria, fever, debility, and cardiac disease; the pulse further, in certain nervous conditions, as in exophthalmic goitre, is greatly accelerated. We seldom experience difficulty in determining the cause of the accelerated pulse. In excitement the acceleration is not persistent, and lasts only whilst the excitement continues. Hysteria may greatly and permanently accelerate the pulse to even 150 or 160 beats per minute. But in a grave illness, whether febrile or not, hysteria, if present before, generally passes away at once, so that we may safely attribute the frequent pulse to the invasion of another and more serious affection. We should, however, bear in mind that the determination or exclusion of the hysterical or neurasthenic element is often a question of great perplexity.

In fevers the pulse is generally accelerated in proportion to the elevation of the temperature, though the relation between the pulse and temperature varies in different fevers. In scarlet fever the pulse is more frequent than in typhoid fever with the same temperature, hence a frequent pulse is of less serious import in scarlet than in typhoid fever. The same elevation of temperature accelerates the pulse, relatively, much more in children than in adults.

When a pulse is more frequent than the temperature will explain, it indicates cardiac weakness—the weakness being proportionate to the want of ratio between the temperature and pulse. In this way the pulse affords important information in prognosis and treatment.

A pulse that, day by day, progressively increases in frequency, the temperature remaining the same, shows increasing cardiac weakness.

In all febrile diseases, a pulse rate, in adults, of over 120 is serious, and indicates cardiac weakness, a pulse of 130 or 140, indicates great danger, and with a pulse of 160 the patient almost always dies. There is, however, a notable exception to this rule in the case of rheumatic fever. In estimating the value of the pulse in this disease, we must carefully ascertain whether the fever itself or a complicating pericarditis occasions the increased frequency. A pulse of 120, if due to the rheumatic fever, indicates great danger. In such a case the temperature runs high, 104° to 105°, the patient is prostrate, the tongue probably dry, and sordes collect on the lips: a case like this often ends fatally, and if the pulse rises above 120, say to 130 or higher, the patient will pretty surely die. But if pericarditis causes the frequent pulse, it becomes then of far less serious import, though it rise, even, to 150 or 160 per minute. Not unfrequently we meet with such cases where, with but slight rheumatic fever, severe pericarditis with perhaps extensive effusion sets in. The temperature is perhaps not greatly raised, rising only to 101° or 102° Fahr.; the tongue remains clean or but slightly coated. Now in a case of this kind, though the beats rise even to 160 and the pulse become very bad in other respects, being very compressible or even small and compressible, yet we may reasonably expect the patient to recover. The heart's substance is generally inflamed in such a case; and this weakening of the heart's substance, coupled with the mechanical embarrassment arising from the pericardial effusion, excites very hurried, even panting, breathing. Thus attacked, the patient often looks very ghastly, the face becomes dusky and distorted with the hideous *risus sardonicus*; yet if these symptoms can be clearly traced to the cardiac mischief, we may hold a well-grounded hope of the patient's recovery, even without the aid of large doses of alcoholic stimulants. In fact, acute pericarditis is rarely immediately fatal, and remotely it destroys life only by leading to dilatation with valvular incompetency, or to fatty degeneration of the heart.

Rheumatic fever with its complications generally ends favourably, no matter how serious the aspect of the patient, and the presence of pneumonia, even when double and further complicated by extensive pericarditis, seldom destroys a patient.

Again, an irregular pulse from mitral disease may be very frequent, 120, 130, or more, without indicating extreme danger.

Sometimes, in acute fever, as, for instance, typhoid fever, though the temperature is high, the pulse remains normal throughout the attack; such a pulse certainly shows absence of cardiac weakness, and is of course a favourable sign.

In chronic diseases a frequent pulse very generally indicates cardiac weakness.

With increased frequency other signs of cardiac weakness are often associated. The weakened heart propelling the blood less energetically than in health causes diminished arterial tension, and the pulse becomes soft and compressible. Relaxation of the arteries plays a part still more important in producing a compressible pulse; this condition permits the blood to pass with greater readiness into the veins. This relaxed condition of the arterioles, unless the heart is very weak, causes the pulse to be large and voluminous. At first one might erroneously suppose that this pulse indicated an energetic arterial circulation and a well-beating heart, but the compressibility soon corrects this error. It is therefore highly important always to test the compressibility of the pulse. If the heart becomes still more weak, and the arterioles still more relaxed, then each beat propels little blood into the arteries, and these allowing the blood to pass readily into the veins, the pulse becomes small as well as quick, *i.e.* short and compressible. Smallness of the pulse, therefore, indicates still greater weakness. When the pulse is very small, it is said to be thready.

When the heart is weakened, its contraction often becomes sudden and sharp, rapidly reaching a maximum and rapidly declining, giving rise to a short pulse, which thus often gives evidence of cardiac weakness, especially when combined with the other and surer indications of this state.

In estimating, therefore, the condition of the heart, we pay regard to the frequency, especially with reference to the temperature, to the compressibility, and to the size of the pulse. The more frequent, the more compressible, the smaller the pulse, the greater the cardiac weakness, and the more imminent the patient's danger, and the greater the need for cardiac stimulants.

These pulse signs, therefore, both in febrile and non-febrile disease, are indications for giving cardiac stimulants, especially alcohol. These pulse signs, moreover, afford an accurate index of the effects of alcohol and of the amount required; for alcohol strengthens the debilitated heart, reduces the frequency of its beats, and contracts the vessels, and so heightens arterial tension and lessens the compressibility of the pulse.

Both in acute and chronic affections cardiac weakness is, as a rule, accompanied by evidence of general weakness, though this is by no means always the case. We may be called to a patient with an acute illness who at first sight shows no evidence of weakness; his temperature is found to be from 102° to 103°; he easily turns over or sits up in bed; his voice is strong; his tongue moist and but little furred, perhaps even clean; he takes his food and apparently digests it well. He sleeps well at night and is free from delirium; in fact, the general appearance of the patient indicates no danger; but the heart beats at, say, 130 per minute, and the pulse is small, compressible, and quick. This is not due to excitement, as we ascertain by repeated observations; now this patient is, in fact, in considerable danger. Are we then to pay regard to the pulse rather than to the general condition? Certainly to the warning pulse, for, in a case like the one just described, serious symptoms will set in in a few days, and the patient will sink. The pulse here, therefore, is a much prompter and surer danger-signal than the other symptoms. To take another instance:—A febrile patient when first seen presents no serious symptoms, but as the case goes on, and whilst the patient's general state remains apparently satisfactory, the pulse gradually increases in frequency and loses in force. Here again the pulse is the better guide, giving, as it does, early indications of approaching general prostration.

We must, however, bear in mind that, owing to individual peculiarity, the pulse in some persons is easily made very frequent, and a moderate amount of fever may accelerate the pulse and make it 130 or even 150, without this frequency indicating any danger. Our previous knowledge of the patient will alone enable us to rightly estimate at its true value the frequency of the pulse in these cases.

Again, we meet with cases of this kind:—A patient suffers from a moderately severe attack of fever, and the pulse is by no means frequent in proportion to the fever, but it is very small and very compressible. In forming our prognosis, are we to be guided by the smallness and compressibility, or the frequency of the pulse? In most cases, certainly, by the frequency, for the size and compressibility of the pulse vary even in health within much wider limits. In some persons in perfect health and capable of vigorous exertion, we find a very small and compressible pulse—one that might even be called thready. Such a pulse often occurs in various members of the same family. Now if such a person becomes febrile the pulse becomes more frequent, though there be little appreciable change in volume and compressibility—and it is obvious that if we disregarded frequency and paid attention only to the size and compressibility, we should be misled, both as regards prognosis and treatment. Of course our previous knowledge concerning the patient will, in many instances, save us from falling into error; but should we see the patient for th first time in a febrile attack, and we regarded the size and compressibility rather than the frequency, we should probably be misled. On the other hand, if a previously good pulse becomes small and compressible, this change is significant; but it rarely happens that this change occurs without a corresponding increase in the pulse's frequency.

It is true that sometimes signs of danger arise first in other organs, perhaps in the nervous system, in the form of sleeplessness and delirium, yet, as I have pointed out, so long as the pulse remains good we feel that our patient is comparatively safe. Should the nervous perturbation neither spontaneously decline nor yield to treatment, the pulse will ultimately fail and the patient sink.

An infrequent pulse occurs in some cases of blood-poisoning, as in jaundice, uræmia, and in these cases the temperature is often subnormal.

In some cases of pericarditis at its commencement the pulse falls greatly in frequency, and in rheumatic fever, if the pulse changes suddenly and greatly in frequency, especially without corresponding change of temperature, we should expect the onset of pericarditis or other cardiac complication.

An infrequent pulse is met with sometimes in fatty degeneration of the heart, and in aortic obstruction, in irritation of the vagus or its root, as in meningitis, cerebral tumours or compression. In the defervescence of fevers the frequency of the pulse may be much diminished.

The size of the pulse varies in disease. It is often large at the commencement of fever, the ventricle acting strongly whilst the arterioles are relaxed. In aortic regurgitation, the pulse is very large during systole, but during diastole it disappears from the great emptying of the arteries.

The pulse is small in inanition, owing to the small quantity of blood. It is small, too, in mitral obstructions, mitral regurgitant disease, and in aortic stenosis, also in cardiac debility.

In the case of an *intermittent pulse* an occasional beat is missed, the rhythm being otherwise regular. The omitted beat may occur frequently or infrequently, at an equal or irregular interval. It must be clearly understood that an *intermittent pulse* is very different from an *irregular pulse*, and has an altogether different significance. Some persons have a life-long intermittent pulse, but in general it does not occur till after middle age. It may be persistent or occasional; when occasional only, it is often due to an idiosyncrasy, and is caused perhaps by some article of food, such as tea, especially green tea, or it may be caused by smoking. Certain patients are unconscious of the intermission, and as Sir W. Broadbent points out, this is especially the case when the intermission is habitual. Other persons are m[illegible] uncomfortable and nervous by a sensation as if the heart st[illegible] over. The intermission often occurs in the artery only, but it corresponds to a weak beat of the heart.

In most cases an intermittent pulse is of no significance, and does not appear in any way to imperil life, though Sir W. Broadbent states that a patient so affected succumbs more readily to illness; when, however, it is associated with unequivocal evidence of heart disease, intermittence is of more serious import.

An irregular pulse is of far more serious significance than an intermittent one. The pulse may be irregular both in force and rhythm, succeeding beats differing in length, force, and character. Irregularity is generally due to mitral affection, and rarely occurs in other forms of heart disease, though sometimes it is met with in great cardiac prostration, as in an acute febrile illness a few hours before death. It occurs also in fatty degeneration of the heart, and in the first and second stage of meningitis. It may be called the mitral pulse, after its most frequent cause, and it generally indicates the need of digitalis, which, in most instances, lessens or removes the irregularity.

Whilst an irregular pulse almost always indicates mitral disease, it must be borne in mind that a perfectly regular pulse may accompany extensive mitral disease, either obstructive or regurgitant, or both combined.

Some hold that the occurrence of irregularity in mitral disease is a sign of deficient compensation, the compensation being insufficient to meet the obstruction to the circulation offered by the mitral disease. But were this view correct, how does it happen that a few doses of digitalis will in many cases restore regularity, and that upon the discontinuance of the digitalis the irregularity does not return?

The irregular pulse is very rare in children under twelve, though the conditions which would produce it in adults may be well marked. If, say, between six and seven, mitral disease is established, and the child, though suffering from its effects, lives till it is over twelve, the intermittence will then be gradually developed.

Though irregularity from mitral disease is rare in children, yet I have several times seen aconite, in half-drop doses, repeated hourly, produce marked irregularity of the pulse. Irregularity of the pulse in children is common in the first and second stages of tubercular meningitis; in fact, its existence is often a valuable diagnostic guide. In some cases of cerebral disease, with Cheyne-Stokes' breathing, the pulse is affected by the respirations: as these grow more and more shallow the pulse grows slower and slower, and then again becomes frequent when the patient takes a deep sighing breath.

An irregular pulse may be due to much smoking, to venereal excesses, and to tea-drinking.

Hitherto I have referred to the dependence of the pulse exclusively or mainly on the condition of the heart. But the condition of the blood-vessels themselves also influences the pulse.

Through the action of the vaso-motor nerves on the muscular coat of the arteries the small blood-vessels undergo relaxation or contraction. When the vessels are relaxed, the blood passes easily from the arteries to the veins, hence arterial tension is slight, and the pulse is soft and compressible, whilst owing to the relaxed state of the vessels it is also large. A relaxed condition of the arteries, therefore, produces a large, soft, compressible pulse.

In most diseases a relaxed condition of the arteries is associated with a weak heart. Sometimes, however, we have arterial relaxation with a normal heart, in which case the large pulse is less compressible. This pulse is met with in the early stage of some fevers; it is sometimes spoken of as "bounding."

Arterial relaxation, or, in other words, diminished arterial tension, produces dicrotism. In this, one of the normal secondary waves of oscillation becomes greatly exaggerated, so that it can be easily felt by the finger. Indeed, it may be so distinct that an inexperienced person, mistaking it for the primary wave, might easily be led, erroneously, to think it indicated a cardiac contraction: a nurse has been known to make this mistake, and thus to double the number of true pulsations. Dicrotism always indicates marked arterial relaxation, and often coincides with cardiac weakness. Some writers insist that this pulse indicates the use of alcohol, which should be pushed till the dicrotism ceases. Now in this opinion I cannot concur, feeling convinced that in many cases with marked dicrotism no alcohol is needed. We must look rather to the frequency of the pulse, and if this shows the need for stimulation, then no doubt dicrotism affords additional evidence in favour of giving alcohol.

A dicrotous pulse is frequently met with in typhoid fever.

I now come to the *pulse of high arterial tension*. Here the vessels are much contracted, and, as a result, the blood escapes with greater difficulty from the arteries into the veins; the arterial tension under these circumstances is high. In some of the following remarks I borrow largely from Sir W. Broadbent's valuable lectures on the pulse; the pulse in question cannot be better described than in his own words:—

"The artery, usually rather small but sometimes large, is hard and cord-like; it can be rolled under the finger and is easily traced in its course up the forearm, where it feels like another tendon lying amidst those in front of the wrist. It reminds one, as I have often said, of the vas deferens."

With the vessel in this condition the pulsation is often so slight that it might readily be mistaken for a weak pulse, but that its incompressibility prevents our falling into this error. It can be compressed only by using considerable force. It is, in fact, a slightly pulsatile pulse, for owing to the high arterial tension the vessel with each beat of the heart undergoes but little dilatation, hence the pulsation is indistinct. In addition to being small, the pulse is slow and hard.

We may enumerate the following causes of increased arterial tension—

1. Degeneration of vessels.
2. Bright's disease, especially the contracted kidney.
3. Gout; lead-poisoning; jaundice.
4. Affections of the nervous system.
5. The rigor of fevers.
6. Certain drugs, *e.g.*, ergot, gallic acid, digitalis.

High arterial tension accompanies some forms of Bright's disease; it is especially marked in the acutely-inflamed and in the granular-contracted kidney; in respect of the latter, indeed, high arterial tension, and hypertrophy of the heart, associated with an increased quantity of urinary water containing a small quantity of albumen, enable us to diagnose the contracted form of Bright's disease. The albuminoid kidney is not associated with high arterial tension.

In general, a soft, compressible pulse, *i.e.* of low tension and marking a weakly acting heart, is also the expression of weakness of the whole system; but we meet with many exceptions to this rule, and it is possible for a patient to be prostrate, nay, even moribund, whilst maintaining a pulse of high tension. Thus even in the last stages the radial artery may feel hard and to the touch like a firm cord, distinctly traceable some way up the forearm, even during diastole, and in like manner the temporal artery may be firm and resistant. This combination of a small, resisting, high-tension pulse with great general weakness, is, I think, more commonly seen in children, and is sometimes strongly marked in tubercular meningitis and capillary bronchitis. The point to lay stress on is that, whilst such pulse indicates *present* cardiac vigour, it is compatible with general weakness and early cardiac breakdown.

It is obvious from these facts that we must not be led to give a too favourable opinion because of the high-tension pulse, and when the frequency and the tension point in opposite directions we must rely on the frequency rather than on the tension. In those cases just mentioned, where the heart is nearing the finish, though the pulse shows high tension of the vessels, we can, from the feel of the pulse, sometimes detect the real condition of the heart, and thus estimate the true state of the patient, without having regard to the frequency of the pulse. Thus, where there is impending breakdown, the pulse, even during diastole, though feeling hard and resistant, and traceable a long distance beyond the point where it is usually felt, still at each systolic distension feels smaller than is usual in cases of high tension of the vessels; moreover, with slight pressure, we can easily arrest the pulse-wave along the vessel.

Here, perhaps, I may profitably introduce, though at the risk of some repetition, an account of the modifications the pulse undergoes in the stages of an acute illness. First I will refer to the characters of the pulse of a man, *previously vigorous and robust*, smitten with an acute disease. The pulse will differ in the separate stages of the fever, viz., in the chill, the acme, and the decline. During the rigor or chill the arteries contract, and produce a pulse of high arterial tension. The pulse is frequent, small, often very small, hard, incompressible, and long, or, as it is otherwise termed, slow. The chill over and the fever established, the arterioles relax and the pulse becomes larger, but as the heart is not yet weakened it is full, and not easily compressed—bounding, as it is called. When the fever persists during many days and the patient grows weak, the pulse becomes softer and more compressible, short (or quick) and often dicrotous. In the case of a fever with great prostration the pulse will be very frequent, small, short, and very compressible, these characters becoming still more marked if the illness is to terminate fatally. If in the supposed case the patient, *previously in weak health*, is suddenly attacked with an acute illness, the pulse from the first will assume these last characters. During the decline of the fever, especially when it ends abruptly, and is accompanied by free sweating, the pulse, unless the patient has been greatly weakened, is large, very soft, *i.e.* easily compressed, dicrotous, and short—there are present all the characters, indeed, of extreme arterial relaxation. In point of fact, in febrile diseases, even during their height, and in non-febrile diseases too, when the skin perspires freely, this is generally the character of the pulse. And this also is the pulse of acute rheumatism, because this disease is usually accompanied by sweating. Again, in a febrile disease, when by means of a drug we convert the dry into a moist skin, we find that the pulse becomes soft, large, and compressible.

In well-marked aortic regurgitation the pulse is often characteristic. It is a pulse of extremely low tension. In this affection the blood during diastole flows back into the ventricle, so that the arteries become more or less emptied of blood. The ventricle being hypertrophied and dilated, propels a larger quantity of blood with greater force than usual into the partially-emptied arteries, and suddenly distends them. This explains most of the phenomena of the aortic regurgitant pulse. The pulse in great arterial relaxation (low tension) may simulate the pulse of aortic regurgitation, for great arterial relaxation by unduly facilitating the passage of blood from the arteries into the veins empties the arteries more than usual, and these unfilled vessels becoming suddenly distended by the normal contraction of the ventricle, especially during excitement, may give to the finger some of the characters of an aortic regurgitant pulse, but in a much less marked degree. In these latter cases also the pulse is somewhat sudden, and this quality, as in the case of aortic regurgitation, will be accentuated by raising the arm above the level of the heart. Further, if the radial is at all visible with the limb dependent, this visibility will become much more marked on raising the arm. Indeed, it may become visible only on raising the arm.

The pulse of aortic regurgitation is of two kinds, depending on the amount of regurgitation and the strength of the heart. The pulse in early cases rises gradually in the usual way till it reaches its acme, and then suddenly collapses, the collapse being due to the regurgitation of the blood into the ventricle. In more advanced cases the pulse gives to the finger a sharp, quick stroke. The extreme suddenness in the commencement of the pulse, as Dr. Galabin observes, gives to the finger in marked cases the impression of a sudden blow or jar. This is the diagnostic quality of the pulse. In some cases, especially when the heart is weak, if several fingers are placed on the artery, and the pressure is graduated, the pulse feels at a certain degree of pressure as if a small ball or shot were puffed under each finger. This is the shotty pulse.

This character of pulse can often be felt best by grasping the wrist with the whole hand, so as to feel both ulnar and radial arteries, and these characters are increased also by raising the wrist high above the level of the heart, thereby enabling gravitation to assist the aortic regurgitation to empty the arteries. This quality of pulse is often felt only when a certain degree of pressure is made on the artery, becoming much less by diminishing or increasing this pressure.

In aortic regurgitation, as Dr. Corrigan pointed out, the pulse is often visible in the more conspicuous arteries. In fairly nourished persons the radial pulse is not visible in health, but it is often distinctly visible in healthy thin persons. In aortic regurgitation it becomes far more visible at the wrist when the arm is raised over the head. This visible pulsation is probably due, according to Corrigan, to the empty condition of the artery during diastole. The blood flows easily into the veins, and much is poured back by the aorta through the patent aortic orifice into the ventricle, hence the imperfectly filled arteries, on receiving the impact of the blood from each contraction, become widely dilated.

Is visible pulsation diagnostic of aortic regurgitation? Certainly not. Visible arterial pulsation of the vessels of the neck and head accompanies not only aortic regurgitation, but also fibroid degeneration of the vessels, great arterial relaxation, and high arterial tension. Mere excitement, by increasing the force of the heart's contractions, often produces in nervous persons visible carotid pulsation, and this phenomenon is more frequent in women. But this nervous pulsation rarely extends more than half-way up the neck, and hence can generally be at once differentiated from the visible carotid pulsation due to more serious causes. Visible pulsation of the whole length of the carotid to the lobe of the ear and of the temporal, and perhaps of the facial artery, is far more frequently due to aortic regurgitation than to high arterial tension or to the opposite condition, low arterial tension, or to degeneration of the arteries. Therefore extensive visible arterial pulsation in the neck, that is, when the pulsation can be distinctly seen as far as the back of the lobe of the ear, is strongly suggestive of aortic regurgitation; I should mention, however, that visible pulsation is well marked in pericarditis accompanied by carditis or pericardial effusion, conditions generally associated with marked arterial relaxation.

Aortic regurgitation, degeneration of the arteries, and high arterial tension, will produce distinct visible pulsation not only of the carotid, but likewise of the brachial, radial, ulnar, and other arteries.

These three conditions—aortic regurgitation, arterial degeneration, and high arterial tension—may be combined, though they will not co-operate, the aortic regurgitation antagonising to a greater or less extent the conditions which produce high arterial tension. Aortic regurgitation is especially a disease of middle or advanced life, the end-arteritis and endo-carditis which cause it being due to age and strain from some laborious occupation. This chronic inflammation, however, often affects the entire arterial system even to the smallest vessels, and by rendering them inelastic, and by narrowing the lumen of the smaller vessels friction is increased—a greater hindrance is offered to the passage of the blood, and the tension within the vessels rises. Thus the factors which cause aortic regurgitation and which raise blood pressure may co-exist.

How can we distinguish between the visible brachial pulsation due to simple arterial degeneration, and that due to simple aortic regurgitation? In arterial degeneration the arteries become elongated and tortuous, this is easily visible in the brachial just above the elbow. A tortuous pulse, therefore, always suggests arterial degeneration. Moreover, in arterial degeneration the arteries feel hard and cordy, even when all blood is pressed out of them, and sometimes calcareous plates or atheromatous hardenings can be distinctly felt. A tortuous condition of the arteries as of the brachial, does not, however, always point to degeneration, for, as Sir William Broadbent tells me in confirmation of my own experience, this tortuosity may be produced by high arterial tension, but he says it occurs only when high arterial tension has endured for some time, and that it is not seen in the cases of high arterial tension accompanying acute Bright's disease.

Long ago, Corrigan pointed out that raising the arm increased the visibility of the radial pulse in aortic regurgitation, and he used this fact to support his theory of the mode of production of visible arterial pulsation in aortic regurgitation. This increased visibility of the radial pulse on raising the arm will not, however, enable us to diagnose aortic regurgitation, for in arterial degeneration the visible radial pulse becomes decidedly more obvious in this position, though the difference is perhaps not so great in degree as in well aortic regurgitation. I may mention that in children even with considerable aortic regurgitation the pulse is rarely visible.

In many cases of advanced aortic regurgitation, when the observer's ear is placed in the palm of the patient's hand raised above the level of the heart, each beat of the pulse is distinctly audible. Extreme arterial relaxation without aortic regurgitation will, however, produce this same thud-like sound. It is probably due to the sudden distension of the relaxed arterial walls. In advanced cases of aortic regurgitation a double murmur may be audible on listening with the stethoscope over a large artery. This double murmur is heard best over the femoral, just at Poupart's ligament. The diastolic murmur is audible only with a certain degree of pressure, and is often quickly lost by any increase or diminution of the same. The systolic murmur can, of course, be produced in health by pressure. It is the diastolic murmur which points to aortic regurgitation.

In aortic regurgitation we often meet with the capillary pulse, first noticed by Quincke, who points out that it also sometimes occurs in health, and is best seen under the finger nails. It is not visible, I believe, in the skin of the forehead in healthy persons, but a slight pulsation sometimes occurs in cases of very low arterial tension. I have seen it after a copious hæmorrhage, and it is also seen sometimes in pernicious anæmia (Osler). It is much more marked in aortic regurgitation, if the regurgitation itself is marked. When the skin is reddened by irritation, the blush pulsates synchronously with the heart's beat. It is observed best in parts situated on a higher level than the heart, as the forehead and temporal region. With each diastole the skin becomes pale and reddens again with the systole. The explanation of these changes is obvious. During diastole the blood flows back into the ventricle, and the arteries become comparatively empty, those especially which are situated above the cardiac level; hence during diastole the reddened skin grows pale, but during the systole the dilated vessels again fill, and a blush diffuses itself over the skin. The capillary pulse is also visible in the extremities, but is much more marked when hand or foot is raised above the heart's level. This capillary pulse is well seen in the sole of the foot after reddening the skin by putting the foot in hot water, or mustard and water, and it is well brought out by wrinkling the skin, by strongly extending the foot and flexing the toes; the skin then, along the wrinkles, becomes pale, but reddens with each systole. The pulsation is well marked also, even when the foot rests below the heart's level. As would be expected, pressure on the artery supplying the surface under observation arrests the visible capillary pulsation.

Brunton describes a capillary pulsation synchronous with respiration as well as with the heart's beats. He also suggests that there may be a third cause of the variations in redness, namely, the peristaltic contraction of the arteries, and certainly one sees blanching and redness which are not dependent on the heart or breathing occurring less frequently than the respirations, and lasting longer than a respiration.

The pulse of aortic obstruction, so long as the left ventricle remains undegenerated, is slow, *i.e.* long, generally small, infrequent, and often hard. It is slow and small, because even the hypertrophied ventricle can force the blood but slowly through the narrowed aortic orifice. It is infrequent because of the great length of each systole. If there is co-existing insufficiency, of course, the character of the pulse is much modified. When compensation fails, the pulse becomes small and compressible.

In marked mitral obstructive disease, the pulse, when not irregular, is small and compressible.

In arterial degeneration the vessels become elongated and tortuous, and the pulse-beats become very visible. The artery feels hard and like a cord, or like the vas deferens, and sometimes the calcareous plates may be felt even in the radial artery at the wrist. This is a very significant condition, being evidence of senile decay of the arteries, a condition which leads to atrophy and degeneration of the organs. Many persons are constitutionally much older than their years warrant—they are, in fact, prematurely old; on the other hand, many old people show few signs of old age. In individuals prematurely old the arteries are found in a state of degeneration, whilst in hale old people the arteries show few or no signs of degeneration. It has been well said that a man is as old as his arteries. One should perhaps add, however, that degeneration of the arteries of a given locality does not of necessity involve degeneration of those of another.

The pulsation in this condition is ill felt, and if the artery is very rigid there may be none perceptible. In a sphygmogram the line of ascent is slow, and lower than normal. The top of the trace is rounded, and the line of descent is more gradual with less distinct secondary waves.

The rate of propagation of the pulse may be delayed in arteriosclerosis (fibroid). If this condition is more marked on one side, or if the origin of the vessel as it arises from its trunk is narrowed, then the pulse-beats at the wrist occur later on this than on the opposite side. Aneurism of the aorta, also, often delays the pulse, and it may do this on one side more than the other, or on one side alone. In aneurism of the aorta influencing the arteries of one arm only, the artery on this side can be felt to fill more slowly, and sometimes the distention of the artery is distinctly divided into two parts, by two impulses almost continuous, the second being the less considerable. These effects are still better seen in a sphygmogram, which exhibits the following characteristics: the line of ascent is more gradual (it may consist of two parts), the top of the trace is rounded, and the waves in the line of descent are much less distinct.

Dr. Augustus Waller describes a "recurrent pulsation in the radial artery." After compressing the radial pulse and completely obliterating it, he points out that in many cases the pulse still beats at the distal side of the fingers. The arterial wave which produces the pulsation, he explains, comes from the ulnar artery and travels through the radio-ulnar inosculating arteries, and so reaches the radial artery at a point distal to the site of compression. If the ulnar artery likewise is compressed, this pulsation at the distal side of the fingers ceases. This "recurrent pulsation" is generally found in persons with relaxed arteries, in whom the heart beats fairly well; for a weak heart is unable to propel a wave from the ulnar to the radial artery. Dr. Waller finds this recurrent pulse twice as often in women as in men.

THE SKIN

The condition of the skin affords us a series of instructive symptoms; but in this place I must restrict myself to speak only of a dry, a moist, and a profusely wet and sodden skin.

In most fevers with persistently high temperature the skin is hot, often pungently hot. Now, if we make the patient's skin comfortably moist, we shall considerably promote his comfort and well-being. Small, often-repeated, doses of tincture of aconite or tartar emetic, or full doses, repeated every three hours, of spirit of mindererus, will induce perspiration. Of these aconite and tartar emetic are the most efficient. In fevers without lung implication, aconite is best; but in catarrh, bronchitis, or pneumonia, tartar emetic is preferable.

In many cases of diabetes and Bright's disease it is very difficult to make the dry skin perspire.

The occurrence of sweating often suggests hints for treatment, or assists the prognosis.

The two chief causes of sweating are weakness and a fall in a febrile temperature, two causes often combined in the same person in exhausting febrile diseases, as in phthisis.

In a non-febrile patient the readiness to perspire often indicates weakness, and even measures its amount; thus, in depressed health a person finds that exertion, even slight exertion, or any excitement, causes too free sweating. A trainer knows well that a trainee is in bad condition when he perspires too freely.

Again, in exhausting diseases, and during the weakness of convalescence, slight exertion may produce sweating, often profuse. In similar states of body sweating is liable to be very marked during sleep. It must, however, be borne in mind that in sound health great differences in respect to the amount of sweating are met with in different individuals. A person returning from a residence in a hot climate, where his skin has habitually acted very freely, finds on his return to a colder climate that under slight exertion he still continues to perspire very readily.

Profuse sweating occurs during the sudden fall of a febrile temperature, as in the sweating stage of ague, or during the fall of temperature after a rigor in pyæmia. Phthisical patients, too, in whom there occurs a great diurnal variation of temperature, this rising to 102° or higher at night, and falling to normal or subnormal in the early morning hours, commonly undergo with this fall a drenching perspiration. The amount of sweating in febrile cases depends on the extent of the fall of temperature and the weakness of the patient. Where the weakness is great the sweating is often profuse, though the fall in the temperature may measure only two degrees or less.

These two forms of perspiration when uncombined can be easily discriminated. Except in the case of pyæmia, there occurs in febrile diseases once only in the day a rise and fall of temperature, and consequently sweating, when due to a fall of temperature in fever, occurs but once daily, and as a rule early in the morning. In weakness, on the other hand, sweating may break out at any hour, and many times a day, being occasioned by exertion, sleep, or excitement.

In my experience, profuse sweating is, as a rule, more common and lasts longer in the convalescence from scarlet fever than in other acute febrile diseases, and hence, during the recovery from scarlet fever sudamina in large crops are often seen. These greatly hasten desquamation, the skin sometimes coming off in large patches.

With the exception of rheumatic fever, profuse sweating at the commencement of an acute febrile disease, whilst the temperature remains permanently high, indicates great weakness and adds to the gravity of the prognosis. When beside profuse sweating there is duskiness of the face, ears, and matrices of the nails, showing weak circulation from enfeeblement of the heart, the serious aspect of the case is strengthened. Again, the feel of the skin shows the condition of a patient. With much perspiration, the skin soft and sodden, points to general weakness, a state accompanied by a soft, perhaps large, pulse. These signs often indicate the need for alcoholic stimulants.

THE TEMPERATURE OF HEALTH

WITHIN certain narrow limits the body maintains a fixed temperature in health, but within these limits the temperature varies in a definite daily cycle. During the day the temperature remains about 99°, but towards evening it begins to fall, and generally reaches its minimum at midnight. At this point it remains steady during a few hours, and then begins to rise, reaching its maximum about 9 a.m. T

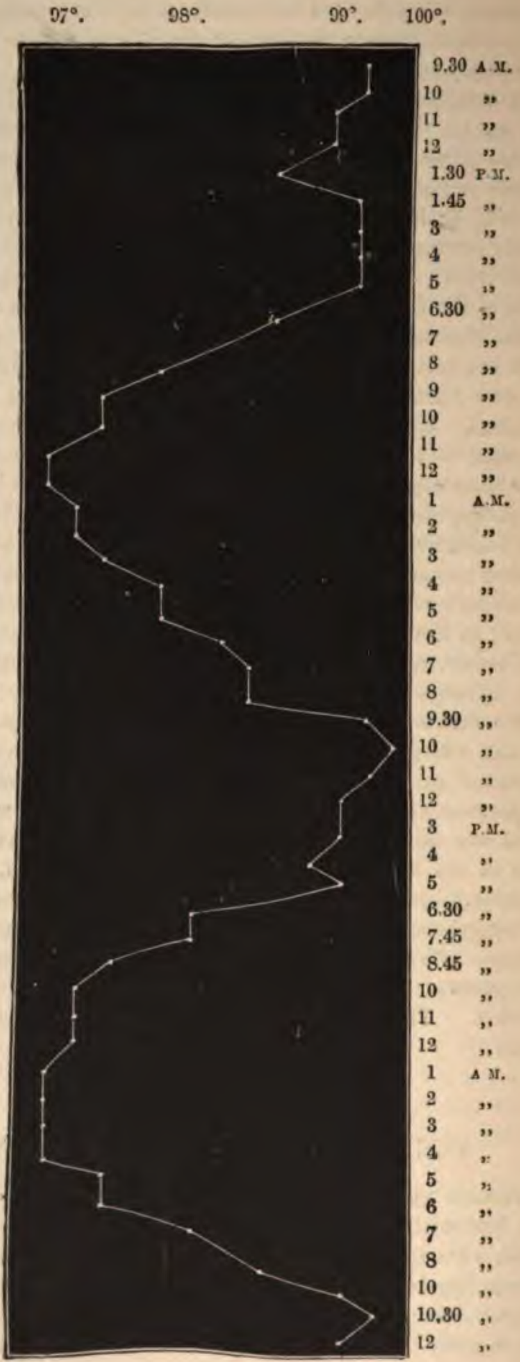

CHART OF THE TEMPERATURE OF A HEALTHY LAD TWELVE YEARS OF AGE.

diagram of the temperature of a lad twelve years of age illustrates the daily course of the temperature in health.

The chart shows at once that a temperature normal during the day would be abnormal at night, and *vice versâ.*

During the day, between 9 a.m. and 4 p.m., the healthy temperature is usually about 99°; it may not be higher than 98°, or it may rise to 99·5° Fah. Any rise above 99·5° constitutes fever. About four in the afternoon the evening fall begins, and at midnight the temperature is about 97°, or even as low as 96°, Fah.

Whilst in many robust adults the temperature runs the same course as in children, yet in others the course is somewhat different from that just described; thus the daily variations will not be so considerable, the maximum and minimum temperatures being less.

In persons under 25 the daily variation is 2° Fah.; in persons over 40 it is more restricted, being often only 1°, or even less.

Jaeger finds that the daily variation is greater in persons whilst labouring than when at rest. At rest he finds the average daily variation to be 2·2, whilst during hard physical work the daily variation may amount to 4·7. His experiments were made on soldiers, the observations being taken in the rectum.

TEMPERATURE IN DISEASE

WHILST any elevation of temperature above 99·5° indicates disease, it need hardly be pointed out that a normal temperature does not necessarily indicate health. Many diseases, both acute and chronic, are, during their whole course, unattended by fever. Indeed, in some diseases, the temperature is depressed below the healthy standard.

The daily course of fever varies with the severity of the disease. In a mild attack there is a considerable diurnal variation, the temperature rising towards night and falling in the early morning hours; but in a severe attack of febrile illness the diurnal variation may be very slight or even absent, the temperature remaining persistently high.

In private practice, as a rule, it is convenient to make but two daily observations, and these should be taken at such times as will obtain the highest and lowest temperatures of the day. The likeliest times to give these minimum and maximum temperatures are 8 to 9 a.m. and 8 to 9 p.m. Though, as a rule, the morning temperature is lower than the evening, the reverse happens in rare cases. In some, especially in chronic cases, as in phthisis, and sometimes in subacute rheumatism, the fever may last only for a few hours somewhere in the interval between 8 a.m. and 8 p.m., and thus normal records obtained at these times will not prove that the patient is absolutely fever-free. If only one observation daily is made, it sh be taken in the evening, as, even in diseases so severe as scarlet fever, the morning temperature may be nearly normal throughout the attack, whilst the evening temperature may rise to 103°; hence a morning observation, only, would lead to a great mistake concerning the severity, and possibly the nature, of the illness.

ABNORMAL ELEVATION OF TEMPERATURE, OR FEVER, ETC.

MANY diseases, contagious and inflammatory, are accompanied by a rise of temperature. It must be borne in mind that the same amount of disease will produce in children a relatively higher temperature than in adults, and that, moreover, individual or family peculiarities are apt to modify greatly the rise of temperature in disease. Some chronic diseases moderate the fever, thus in Bright's disease and diabetes an inflammation may produce little or no rise of temperature.

The derangement of function in a febrile disease is often mainly due to the rise of temperature which depresses the functions of the body, and if of much intensity or duration induces parenchymatous degeneration of the tissues, which likewise impairs function. The dangers, therefore, in a febrile disease are mainly dependent on the high temperature, and are in proportion to the amount of elevation; so that we take the degree of fever as a measure of the depressive effect of the disease. The danger from a high temperature may, of course, be augmented by other circumstances, as, for instance, the diarrhœa of typhoid fever.

It may be said, perhaps, that the symptoms of fevers—general weakness, frequent, feeble pulse, loss of appetite, and delirium—are due to the elevation of the temperature, for by treatment which tends to reduce the temperature to the normal standard we can abate or remove all these symptoms. Moreover, the abnormal elevation of temperature not only depresses *immediately* and weakens all the bodily functions, but, as we have seen, in proportion to the height and duration of the fever, it further produces degeneration of all the organs, and this degeneration again greatly weakens their activity. If the symptoms are referable directly to the depressing effect of the febrile temperature, and indirectly to the degeneration it produces, it would seem a plausible supposition that the height and duration of the temperature should be an exact measure of the patient's danger. A little reflection will soon show that this is but partially true, for though, no doubt, most of the symptoms arise from the high temperature, it must be recollected that its depressing effect must greatly depend on the previous condition of an invaded organ; thus, if previous illness, excesses of any kind, or unhygienic conditions have already depressed the organs, a high temperature will inflict on them much graver mischief. If, for example, rheumatic fever has slightly damaged the heart, a febrile attack will considerably increase the dangers to the patient through failure by the heart. If intemperance has injured the nervous system, a febrile disease will intensify the danger of delirium and depression of the nervous system. We estimate the resistive power of each organ by the severity of its symptoms in comparison with the height of the fever. Thus, if delirium is excessive, whilst the temperature is but slightly elevated, it shows that the nervous system has but little power to resist; and if the pulse becomes very frequent, small, and compressible, it shows that the heart's resistance is but slight. If, on the other hand, with the fever severe, nervous symptoms are but slight, and the pulse, neither very frequent nor small, nor very compressible, then we conclude that the condition of the nervous centres and of the heart is satisfactory and our prognosis is good.

In estimating therefore the dangers of a febrile attack, we must regard not only the severity of the disease, as measured by the temperature and other depressing causes, but the resisting forces of the body. The temperature measures the severity of the attack, but the power to resist is to be estimated only by careful attention to the condition of the different organs, especially of the heart, the brain, and the stomach.

To illustrate these remarks let us take two ordinary cases of typhoid fever. One patient with high temperature takes and digests his food fairly well; he sleeps well, his heart is not much weakened, and in spite of the high fever, or, in other words, the severity of the attack, he makes a good recovery. Another patient, with decidedly less fever, is troubled with sickness, sleeplessness, delirium, and weak heart, and though his attack as indicated by the temperature is not severe, he dies worn out. Again, take two cases of phthisis. One patient, in spite of considerable daily fever, eats, digests, and assimilates fairly well, and for the most part maintains his ground. Another patient, though his fever may be slight, and indeed sometimes even after it has become normal or sub-normal, slowly but surely wastes away, the appetite, digestion, or assimilation being greatly impaired. In certain rare cases, though the appetite is good and the digestion is apparently well performed, yet the assimilation is in some way at fault, and the patient, in spite of plenty of food, wastes away, even in cases in which the temperature has become normal. Hence in a case of phthisis, we must note not only the fever and the appetite, but also the weight, for in a case where plenty of food is ingested, but assimilation is defective, the patient's weight will be the sole measure of his progress.

Does the course the temperature runs give evidence of [illegible] nature of the disease? Whilst, on the whole, this question must be answered in the negative, still it must be remembered that certain diseases, speaking generally, have a somewhat characteristic temperature; thus, in many cases of ague and pyæmia the temperature itself is diagnostic.

The thermometer assists us in diagnosis in cases of the following kind:—A patient becomes ill, and the temperature is found to be raised above the healthy standard. This fact, especially if the temperature is high, makes it incumbent on the doctor to search carefully to discover its cause. To narrow the range of our inquiry, let us restrict our attention to the commoner causes of fever. The fever may be due to the acute contagious diseases, to acute inflammation of some organ, to rheumatism, gout, or to those diseases which cause chronic fever. The doctor, we will suppose, has been called in on the first day of the attack; his first duty is carefully to investigate whether the fever is due to inflammation of any organ. In most instances symptoms and physical signs will enable him to arrive at a conclusion. If the fever cannot be thus accounted for, then he probably has to deal with one of the acute specific diseases; its nature, however, cannot ordinarily be diagnosed with certainty till the characteristic rash appears. Still, even before the advent of the rash, he may give a shrewd guess as to the nature of the illness. Thus, the patient may have been in the company of an infected person, or an acute contagious disease may prevail. Moreover, even before the appearance of the characteristic rash, the symptoms may suggest one or other of the acute specific diseases. Thus, sore-throat would point to scarlet fever; severe backache, headache, and sore-throat to small-pox; coryza with cough to measles. Severe fever, ushered in by a severe rigor, with severe headache, and pain in the limbs, would suggest typhus; whilst dull frontal headache, with diarrhœa, would point strongly to typhoid fever. The mode of onset of the fever, that is to say, the more or less rapidity with which the temperature mounts, and the greater or less elevation which it reaches, also assist in the diagnosis: this point will be more dwelt on presently. Having then in many cases a strong suspicion as to the nature of the attack, the doctor must wait for the rash to confirm or to correct his impression. If the second day passes without the occurrence of a rash, the case, in all probability, is not one of scarlet fever, for the rash of this disease appears on the second day, being very rarely delayed longer, more frequently, indeed, occurring before the second day, sometimes even within twelve hours. If the third day elapses without a rash, he is not dealing with a case of small-pox, for this rash usually appears punctually on the third day. In measles, it is commonly said that the rash appears on the fourth day; but in many cases this statement is certainly erroneous, for the rash often appears on the first day of the fever, and I have seen it even precede the fever. In many instances, however, though there is no fever, the patient suffers from coryza and cough for three or four days; but these symptoms may not occur till the rash appears on the very day that the temperature rises. This being so, it may certainly be fairly taken that if the fourth day passes without a rash, the case is not one of measles. If the fifth day passes without a rash, the case is not typhus, for typhus rash appears punctually on this day. The foregoing diseases being excluded, there remains only typhoid fever, or one of the diseases producing chronic fever, and the chief diagnostic difficulty will lie between typhoid fever and acute tuberculosis, the other diseases causing chronic fever being, in most cases, easily detected.

As the eruption of typhoid throughout the attack may be either altogether absent or be manifested only by a very few spots, which may possibly escape detection, we must in some cases diagnose this disease irrespective of the rash.[1] The rash, when present, appears between the eighth and twelfth days, and if characteristic, makes the diagnosis certain. If we are led to exclude typhoid, then, as I have just said, we have probably to deal with a disease which causes chronic fever. The diagnosis of the diseases referable to this head will be treated of when we speak of chronic fevers.

I now give another instance of the diagnostic value of temperature. A patient is suddenly seized with severe pain in the side of the chest. The pain, shooting or stabbing in character, is intensified on coughing or deep breathing. This is the characteristic pain of pleurisy and of pleurodynia—one an inflammatory disease, the other a non-inflammatory disease—which is it? A physical examination, it may be said, will at once discriminate one from the other. But suppose the doctor has been summoned at the very onset of the attack, whilst the signs are still undeveloped? No doubt the cough, present in pleurisy, may be absent in pleurodynia, but pleurodynia may occur in a patient with slight catarrh of the bronchial tubes, and one would not venture to base the distinction between these diseases simply on the presence or absence of cough. The thermometer alone solves the difficulty. If the attack is pleurisy, an inflammatory disease, then there is fever; whereas if the attack is pleurodynia, a non-inflammatory disease, fever is absent.

In studying the temperature curve of fever, we must notice the mode of its rise, its character whilst at its height, and in a lesser degree, as of less importance, its decline to the standard of health. The character of the rise often helps us to form an opinion of the nature of the illness. In most febrile diseases the temperature rises rapidly, reaching its acme in twelve to twenty-four hours. This rapid rise occurs in the fever of most inflammations, and also of typhus, scarlet fever, measles, erysipelas, etc. Where the rise is sudden and rapid, the onset of the symptoms is equally sudden and accentuated, the rise being generally accompanied by chills or rigors: in typhus and pneumonia, by a single severe rigor. This sudden and rapid rise, being common to so many attacks, is of little diagnostic use beyond serving to exclude those diseases in which the invasion is more gradual. In respect of these we observe that, in some diseases, the temperature rises more gradually, taking three or more days before it attains its maximum. This happens in most cases of tuberculosis and in almost all cases of typhoid fever, and sometimes in rheumatism and pleurisy—a large proportion of pleurisy cases is probably tubercular. This gradual rise of temperature is therefore suggestive of the invasion of these diseases, and if there is no joint pain, the case is likely to prove either typhoid fever or tuberculosis, diseases which often simulate each other so closely at the commencement as to baffle the discrimination of the most experienced. But as, unfortunately, in diseases with slow invasion of the fever, the doctor is seldom summoned till the temperature has become well developed, he has not often the opportunity for ascertaining how it has comported itself at the beginning of the attack. Hence, at this stage, the temperature is seldom a serviceable guide, and the mode of its rise must be estimated from the slow or quick onset of the symptoms.

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[1] In the effect of the serum or of the blood itself of a typhoid fever case upon the movements and the aggregation of the bacilli of typhoid fever we now seem to possess another means of diagnosis of great value.

From the course the temperature runs during the time the fever is at its height, we learn much more than from the mode of its onset, but that which we now learn possesses a prognostic rather than a diagnostic value, though to some extent diagnosis also is aided. At this juncture we must regard the height of the thermometer, the extent of the daily variations, and the duration of the fever. The height of the temperature with its daily variations measures the severity of the attack. The greater the daily variations the more favourable the case. The high temperature, as we have seen, immediately and directly depresses all the functions, and further indirectly lowers them by producing degeneration of all the tissues; these effects of course being manifested in proportion to the height of the temperature. Hence they are far more marked in cases where the temperature keeps high all day, than in cases where, during many hours, the temperature is but little or not at all raised above the limits of health. The pyrexia is the result of the reaction of the body to the poison, and whilst it is certain that, *cæt. par.*, a continuous temperature must damage the tissues more than a remitting or intermitting temperature, yet the significance of the body state, which in the one case responds to the poison by an unbroken temperature, and in the other by a pyrexia with great oscillations, is less certain from the point of view of prognosis. A temperature of 105° always marks a severe attack of any disease, especially if the diurnal variation is very slight. A temperature above 105° threatens considerable danger; and from a temperature of 107° patients, unless treated by cold baths, very seldom recover. A temperature of 110° to 112°, unless it yields to the application of cold, is very quickly fatal.

In the early days of the clinical thermometer it was taught that in some diseases, as in typhoid, the temperature always reached a characteristic height, so that in a given case, if by the fourth day the temperature failed to reach 103·5° Fah., the case was said to be not one of typhoid fever. This absolute rule a more extended experience has shown to be erroneous. Typhoid and other fevers may run their course with the temperature at almost any level above the normal standard. Some writers, indeed, go so far as to maintain that typhoid fever may exist without any abnormal temperature, and if typhoid, say they, why not other "fevers"? Still it must be admitted that the temperature is a serviceable guide in the discrimination of diseases. For example, in the majority of cases of typhus, typhoid, measles, scarlet fever and acute inflammation, the temperature reaches 103°, and certainly if the temperature never exceeds 101°, then, probably, the case is neither typhoid, typhus, scarlet fever, measles, nor any important acute inflammation. Sometimes the thermometer greatly assists us in distinguishing measles and scarlet fever from German measles (Rötheln). Thus, in German measles, the patient often complains of sore throat, and sometimes its rash is so like the rash of scarlet fever, and sometimes so like the rash of measles, that judging simply by the aspect, it is difficult or impossible to distinguish them. In this dilemma the temperature, though not an absolute proof, affords strong presumptive evidence; thus in German measles the temperature in general is scarcely or very slightly raised, *e.g.*, not above 100° or 101°, whilst in measles and in scarlet fever, in the great majority of cases, the temperature runs at a higher level than this.

The course of the temperature when at its height indicates, as I have said, not only the severity of the attack, but helps us likewise to determine its duration. If the temperature is high, and the daily variations are slight or non-existent, a severe attack is indicated, which is sure to persist longer than a case with considerable daily falls in the temperature. The information thus obtained is especially instructive in typhoid fever, for if during the second week there are great daily variations, we have reason to hope that the disease may terminate, possibly on the fifteenth, though more probably on the twentieth day; but if during the second week the daily variations are but slight, then the fever will probably last twenty-five or thirty days.

When the temperature has for some time remained persistently high, the occurrence of morning falls shows the beginning of the decline of the disease.

The duration of the fever helps us to detect the nature of the disease; and, indeed, in obscure cases, it often greatly aids the diagnosis. In most acute inflammations, in scarlet fever, and in measles, the fever usually passes away between the fifth and tenth days; in typhus it ends on the fourteenth or fifteenth day. If the fever persists beyond this time, it is fair to conclude that we have not to deal with one of these diseases; but as, in the majority of instances, the above are easily diagnosed early in their course, it is evident that in such cases the duration of the fever is of little practical use. On the other hand, by enabling us to discriminate between typhoid and tuberculosis and between the other diseases causing chronic fever, the duration of the pyrexia does give us very trustworthy and important evidence.

In some cases of typhoid fever, the symptoms are not sufficiently marked to enable the doctor to decide whether the case is one of typhoid fever, general tuberculosis, or phthisis. If the fever goes on beyond thirty days then, probably, the patient suffers from consumption, and each additional day of fever strengthens this conclusion. In most cases of phthisis, before the thirtieth day, the lungs or other organs will, it is true, generally manifest the nature of the illness; but exceptionally, though not infrequently, the fever of consumption will persist thirty days or more without any characteristic local manifestation. When I come to speak of chronic fever, I shall point out with more particularity that sometimes the thermometer will enable us to detect consumption earlier than the combined aid of symptoms and physical signs.

Any sudden and considerable temperature variation generally forebodes some complication; a sudden and considerable rise always does so. A sudden and considerable fall may, of course, indicate the natural termination of the attack, for, in many diseases, the temperature falls very rapidly then. In pneumonia this is notably the case, and it is not uncommon for the temperature in twelve hours to subside from 105° to the normal standard. A sudden and considerable fall, if not due to the natural termination of the illness, means sudden collapse. It is oftenest met with in typhoid fever, and it may mean hæmorrhage into the bowels, or perforation of the intestine. It must, however, be recollected that during each week in typhoid fever a great morning fall is liable to occur. A fall, indeed, equal to that due to hæmorrhage or perforation, may occur at any time, but the fall with these accidents is more persistent, and is always accompanied by the symptoms of collapse. A sudden great fall with collapse, and without tenderness of the abdomen, is always very ominous of hæmorrhage into the bowel. This hæmorrhage, though considerable, may yet be retained for some hours in the intestines.

A sudden and marked rise in the course of a disease foretells the onset of some inflammatory complication. On the other hand, it is important to bear in mind that such complication, interposed in the course of a febrile disease, may not heighten the existing temperature; hence the fact of the temperature running the ordinary course pertaining to the original attack, does not preclude the necessity for close watching, lest an inflammatory complication should supervene. Thus, an attack of pneumonia or of pleurisy may leave the temperature of pre-existing fever unaffected. Again, it is important to recollect that, as a rule, the onset of pericarditis in acute rheumatism does not increase the fever. This is hardly to be wondered at, seeing that when a fresh joint becomes implicated, the temperature does not alter, and that inflammation of the pericardium may be regarded as analogous to inflammation of a joint.

CHRONIC FEVER

In some diseases fever may persist for weeks or months, and by its very duration help the diagnosis. It is true that in most cases, whilst the fever has lasted only a short time, perhaps only a few days, other symptoms reveal the nature of the disease; but not infrequently the nature of the malady remains for a long time obscure, and in such cases the persistence of the fever is an important help to the diagnosis.

Between acute and chronic fever there is no sharp line of demarcation. Certain acute diseases, for instance, typhoid fever and pleurisy, may each persist for more than thirty days; on the other hand, febrile affections, such as deep-seated abscesses and consumption, which often continue several weeks or months, or even longer, may run a short course of only a fortnight or three weeks.

Since most acute illnesses, even typhoid fever and pleurisy, which persist longer than others, come to an end in the great majority of cases before the thirtieth day, we may take that as the limit of acute fever.

Chronic fever occurs in phthisis, abscess, syphilis, ague, rheumatism, in most cases of leucocythæmia, lymphadenosis, pernicious anæmia, and chronic pyæmia, including malignant endocarditis.

As in acute diseases, so in acute and subacute phthisis, the temperature is a fairly accurate measure of the activity of the disease. In other words, there occurs a daily elevation of the temperature of the body in most of the cases in which a formation of tubercle is taking place in any one of the organs. This elevation is proportional to, and therefore an index of, the activity of the disease, the fluctuations of temperature indicating corresponding fluctuations in the rate of this activity.

As an exception, however, to the above general rule, I must mention that, in tubercular meningitis it is by no means uncommon, though certainly it is not the rule, for the temperature to remain normal throughout the course of the attack, or at all events during the greater part of its later stages. In some cases, for a short period, the temperature is slightly elevated, and then becomes natural, or falls even below the normal point. But even in this disease, in by far the greater number of instances the temperature is elevated, and sometimes, indeed, mounts up to 105° to 108° Fah. In peritoneal tubercle the temperature may be subnormal throughout (Osler).

It has been asserted that, during acute tuberculosis of the lungs, the temperature, in rare instances, may remain normal. With regard to this statement, I believe that in such cases the deposit of tubercle will have gone on by very slight and scarcely appreciable increments, or have become obsolescent at the time the temperature was first taken, so that the fever stage has been overlooked. It must be admitted, however, that in some very chronic cases of phthisis the disease advances too slowly, and the deposit, at any one time, is too slight to be adequate to elevate the temperature, except to a very small extent. Thus, we meet with cases in which, for some time before death, the temperature has been persistently normal, yet the post-mortem examination reveals much fibroid degeneration from old-standing tubercle or catarrhal pneumonia, and, adjacent to the fibroid portions, in the otherwise healthy lung tissue, we see a few recent miliary tubercles, easily counted, or a few small patches of recent tubercular pneumonia. In such cases we may take it that the disease has advanced so slowly that the temperature has been scarcely raised—in other words, that the amount of morbid action has been insufficient to raise the temperature appreciably. Hence, where there is no elevation of the temperature, we may conclude that the progress of the disease is almost insignificant; the patient, however, is exposed to the lurking danger that, from some slight cause, this comparatively harmless condition may be aggravated into a severe and dangerous attack.

Many cases of phthisis set down as afebrile can, I think, be explained in another way:—In this affection, as in other causes of chronic fever where the disease goes on but slowly, it must be borne in mind that the pyrexia may last only a few hours in the day—sometimes not more than three or four, sometimes only in the middle of the day—so that a morning and evening observation may miss the fever, and may lead to the erroneous conclusion that the patient is fever-free.

Another source of error arises from the mode of taking the temperature. Phthisical patients are often very thin, and the bulb of the thermometer, when placed in the axilla, instead of being embraced all round by the tissues, lies half exposed in a hollow cavity, and never acquires the temperature of the body. This source of error is often coupled with another: *e.g.* the patient is perhaps dressed, or has had his arms out of bed, and his axilla has become cooled; under these circumstances it would take half an hour or an hour before the skin of the exposed parts would recover its lost heat so as to mark the internal temperature of the body. Over and over again, in hospital practice, have I been told that the temperature was normal, or even below normal, but on taking the temperature under the tongue, or in the rectum, have found the patient to be suffering from several degrees of fever.

In some cases, it must be admitted, there appears to be a disproportion between the progress of the disease and the temperature. This disproportion occurs, I believe, only in cases of long standing, and when the disease has lasted a considerable time; perhaps in such cases the same dose of poison produces less elevation of temperature now than at first, the patient having become accustomed to the disease, and thus, as in the case of medicines, there is produced less constitutional effect. As the result of my experience, I am inclined to think that the same amount of disease in middle-aged and in elderly people produces less fever than in the young, and that less fever is produced towards the end of the disease, when the patient's powers are greatly depressed.

The temperature is a more accurate indication of the activity of tuberculosis, or of catarrhal pneumonia, than either the physical signs or the other symptoms. Thus, only a considerable increase in the amount of disease can be detected by physical signs, and in disseminated tuberculosis, where the granulations are pretty equally scattered throughout the lungs, and, indeed, often through most of the organs of the body, there may be an entire absence of physical signs. Hence, it is apparent that the physical signs, even in very acute cases, only give us evidence of the presence of disease after the lapse of a considerable interval; whilst it has been shown that in almost all cases there is an elevation of temperature during the formation of tubercle, and that, this elevation being proportionate to the activity of the disease, the thermometer will unerringly, at any time, point out the existence and the amount of disease, except, indeed, in those very chronic cases where the amount of tuberculization or of catarrhal pneumonia is slight and almost insignificant. When it is thus borne in mind that only considerable deposits in the lungs can be detected by physical signs, while a small deposit will raise the temperature, even considerably, and for some time, it becomes evident that the thermometer gives a far better estimate of the amount of mischief than do the physical signs. Moreover, after the cessation of tuberculosis or of catarrhal pneumonia, consolidation from the fibroid changes remains, and from the mere physical signs it may be impossible to recognise the condition of such a lung, and to tell whether disease is progressing or not: the temperature, however, will answer the question for us. If the temperature is natural at all periods of the day, we may safely conclude, after a few days' observation, that active disease has very nearly or entirely ceased.

It must be recollected that the fever is a measure of the *increase* of the tuberculization, not of the damage already done. The disease may cease to extend and the temperature become normal; but the extensive consolidation of the lung which has taken place, may begin, and continue to soften and lead to cavities. Hence, because the fever ceases, and the formation of fresh tubercle or of catarrhal pneumonia ceases, we must not conclude that the patient is free from danger, for the softening and suppuration may lead to a fatal exhaustion.

Observation of the temperature often saves us from error, and enables us to form a correct judgment of the true state of the case. Thus a patient with only a moderate amount of fever, say 102° to 103°, lasting only a part of the day, has been losing weight and growing weaker: on going to the country, the appetite and assimilative powers increase, the patient grows much heavier and stronger, and regains much of the lost colour; on an examination of the chest, we detect no increase in the physical signs, but during the whole time the temperature has risen to its accustomed height, 102° to 103°, showing that the disease still progresses. The explanation of such a case is that the improved appetite has more than obviated the waste from the fever: in other words, that nutrition is in excess of waste.

On the other hand, we must be careful not to pay too much heed to the temperature, or to build our prognosis entirely on it. For it often happens that there is a marked disproportion between the general symptoms and the degree of tuberculization. A patient, *e.g.*, with very slow progressive phthisis and moderate fever, associated with very slight physical signs which develop slowly, has a flagging appetite, and quickly wastes; or sometimes a good appetite, but assimilation is at fault, and so, in spite of plenty of nourishment, he or she grows progressively thinner and thinner. We must, therefore, regard not only the temperature as a measure of the progress of the tuberculization, but, from the point of view of prognosis generally, must likewise take into consideration the patient's weight and appetite, the occurrence of complications, such as diarrhœa from ulceration of the intestines, the presence of albumen in the urine due to fatty kidney, or to albuminoid degeneration, or the evidence of implication of the liver, spleen, and kidneys in the same albuminoid degeneration.

Fibroid phthisis remains now to be considered. Tubercle, behaving as an irritant, induces increase of the connective tissue with formation of fibroid bands, which cause the lung to become tough and fibrous. This condition of lung often co-exists with progressive formation of tubercle. When the further progress of the latter is stayed, this fibroid condition is left. This is the most common mode of production of the fibroid lung, but it may originate in a different way. The temperature in fibroid phthisis varies. In some cases it is quite natural, or if the health is much depressed, it is even below normal. In those cases which go on to cure it is natural. The walls of the cavities become dry, expectoration ceases, the cavities slowly contract, and the patient recovers health and strength, but the induration, very obvious on a physical examination, still remains. Now in a case like this, the temperature often becomes of the greatest importance; thus a patient presents himself with a history of a previous attack of phthisis, we find marked evidences of consolidation of the apices of the lungs, but the patient's health is good, his appetite and digestion vigorous. Are these physical signs simply due to his previous illness, or is phthisis progressing? If his temperature remains for several days quite normal, we may conclude either that there is no progressive tuberculization, or that it is very small in amount; as we shall shortly see, there may probably be a slight amount of catarrhal pneumonia, without rise of temperature.

In another case of fibroid phthisis, even after the formation of tubercle has ceased, we may have a slight daily rise in the temperature, *e.g.* to 100° or even 101°, due to suppuration in the cavities. Suppuration can, of course, raise the temperature under these circumstances, as it can in the case of an open discharging psoas abscess, or other discharging abscess.

The persistence of a slight amount of fever does not, therefore, conclusively prove the continuance of tuberculization. Nor, on the other hand, I think, can we possibly say that whilst the temperature is normal the tuberculization may not be in a very slow degree extending. Clinical experience shows us that a very small formation of tubercle or of catarrhal pneumonia may occur without a rise of temperature.

We very often meet with mixed cases, where, for instance, the upper part of the lung has become fibroid, whilst active disease goes on in the lower part. In cases like this the temperature is raised in proportion to the activity of the acute disease. If the disease progresses slowly, and raises the temperature to not more than 100° or 101° Fah., it is difficult to determine whether the fever indicates an extension of tuberculization, or of catarrhal pneumonia, or is due simply to suppuration in the cavities.

As in acute, so in chronic phthisis, with fibroid lung, we must be careful not to pay sole regard to the temperature. Thus, for instance, the formation of tubercle may have ceased, and the temperature have become normal, but before this has come to pass the health may have become damaged beyond recovery, *e.g.* the kidneys may have become seriously implicated, or the alimentary tract, and through lack of appetite and digestive power the patient may waste away and die; or, again, the uncertain weather, incidental to this country, may irritate the cavities and keep up a continuous suppuration, which exhausts the strength, and by producing further a widespread albuminoid degeneration destroys the patient.

Therefore, in a case of fever-free phthisis, we must take into consideration the general condition as well as the temperature. When appetite, digestion, and assimilation are good, then the patient quickly regains strength and health. Accordingly, in forming an opinion of a case, we must regard the temperature, the appetite, and the weight.

The temperature in phthisis affords us still further guidance, as in the following instance:—A patient throws up a large quantity of blood from the lungs, and the grave questions arise—Is the hæmorrhage due to the congestion which accompanies acute phthisis? or is it independent of phthisis? If the temperature is normal, we may at once exclude acute phthisis, *i.e.* acute tuberculous infiltration; and if the temperature remains normal, we may conclude that the hæmoptysis has not excited catarrhal pneumonia. Again, a patient having recovered from a previous attack of phthisis, which has left well-marked physical signs, spits a little blood. Does this show that he is again the subject of progressive phthisis, or is the bleeding due to ulceration of the walls of an old cavity? Here the temperature, if normal, and continuing normal, enables us to conclude that the hæmoptysis does not depend on another attack of tuberculization.

The thermometer, in many cases, is of still more signal service in giving early and significant warning. By its aid we can often diagnose phthisis before we can detect any physical signs, and this at a period when symptoms themselves are insufficient to justify a grave diagnosis. A patient suffers, for example, from chronic fever: what is the cause of it? So far as we know at present, chronic fever occurs only in tuberculosis, catarrhal pneumonia, large abscesses, rheumatism, ague, occasionally in syphilis, in some cases of leucocythæmia, in lymphadenoma, and in pernicious anæmia and chronic pyæmia, including ulcerative endocarditis. The diagnosis of ague and of rheumatism is rarely difficult, the characteristic symptoms in most cases rendering their identification quite easy. Large superficial abscesses present no difficulty, but it may not be so easy to detect deep-seated abscesses; and in some cases the diagnosis is, for a considerable time, impossible. As a rule, however, they give more or less pain, often to a considerable degree in the immediate neighbourhood of the abscess or, in some cases, the pain may be felt over the spine; moreover, a tumour is generally detectable when the fever, if at all high, has lasted a few weeks. Local symptoms, too, such as pain on movement, stiffness, lameness, etc., will, in most cases, point out the nature of the disease. Sometimes, however, deep-seated abdominal abscesses run a much more chronic course, the temperature then assuming the character so common in fibroid lung; thus the temperature will rise to 101°, or perhaps to 102°, and daily it will reach this height for a few days, then again it may become natural for a variable time, till some cause, *e.g.* over-exercise, once more excites the fever, and the temperature again stands high for a week, a fortnight, or longer. It is often very difficult to determine the nature of such disease, so as to exclude phthisis. True, there are no pulmonary physical signs, but these may be absent in phthisis, while at the same time the local symptoms may be too few to justify the diagnosis of abscess. Having but a limited experience of deep-seated subacute abdominal abscesses, I would wish the following remarks to be accepted with caution. In general there is pain in the abdomen, not constant, but brought on by slight walking; sometimes there are marked dyspeptic symptoms, amongst which flatulence predominates. A slight daily rise of temperature continued for a considerable time, or running the irregular course just described, if accompanied by deep pain and tenderness in the abdomen, the lungs being free from evidences of disease, will, I am inclined to believe, justify the suspicion of a deep-seated subacute abscess. These rules at all events have enabled me to diagnose doubtful abscesses, when, unaided by the thermometer, their detection seemed impossible. I lean to the belief that, with these abdominal abscesses, the fever-free periods, not infrequently, persist longer than in subacute phthisis; moreover, the rise when it does occur can sometimes be traced distinctly and repeatedly to exercise, a recurrence of fever, accompanied by an increase in the other symptoms, occurring after each undue exertion. When an abdominal tumour is detectable by the hand, or when there are evidences of diseased spine, then, of course, the diagnosis is far more easy.

Again, a large discharging sore, or a discharging psoas, or iliac abscess will frequently produce a course of fever like that described under subacute and chronic phthisis. In some cases there may be a slight daily elevation lasting for months, in other cases the abnormal temperature may continue for a few days only, or last one or two weeks, and then for a short time fall again, and this alternation may be repeated for a considerable time. Here the diagnosis is easy, for there is the discharging sore, and the absence of pectoral physical signs or symptoms.

In cases of constitutional syphilis with chronic fever the diagnosis, in many cases, is more difficult, and, unfortunately, but little concerning this subject is known at present. The temperature may be high, rising to 103° and 104° Fah. daily, and the morning remissions usually great, the temperature often falling to 98°. In these respects syphilitic fever corresponds to moderately severe cases of phthisical fever, but distinct and easily recognisable constitutional symptoms generally set in concurrently with the fever. The disease may assume the rheumatic form, and the diagnostic difficulty may lie, not between phthisis and syphilis, but between simple acute rheumatism and syphilis. In some cases the diagnosis has seemed impossible until, on the administration of iodide of potassium, the temperature has at once become normal, or has declined gradually, reaching the temperature of health in one or two weeks. Very large doses may be required.

In syphilitic affection of the lung, the diagnosis may be impossible, though other manifestations of syphilis may suggest the correct diagnosis, which subsequently becomes confirmed on the rapid improvement produced by large doses of potassium iodide.

Assuming the exclusion of the foregoing causes of fever, the question arises—How long must the elevation of temperature persist before we can with probability suspect phthisis, in cases which are free from physical signs or characteristic symptoms, as, for instance, hæmoptysis? From ten to twenty days, I think; each day facilitating and strengthening the diagnosis. In the first few days the diagnosis is well-nigh impossible, but each successive day serves to exclude sources of error. Thus, on the second day, if the rise is due to scarlet fever, its characteristic rash ought to appear; if due to small-pox, the rash should appear on the third day; if to measles, about the fourth; and in typhus, on the fifth day. Before this time, if the rise is due to acute inflammation of the brain, lungs, kidneys, etc., characteristic symptoms and physical signs will have set in. In most cases of typhoid fever the rose spots will appear between the eighth and tenth day; and at this stage we may exclude most cases of simple inflammation, which usually decline before the tenth day, the fever then ceasing. Thus, on the tenth day, or thereabouts, assuming, as we have said, the exclusion of the other causes of chronic fever, the diagnosis will lie between tuberculosis and typhoid fever. In the early stages the discrimination of one from the other is difficult, and may indeed be impossible. Each begins gradually, and is not usually ushered in by chills, convulsions, or rigors, nor have we ordinarily, to assist our judgment, such distinctive symptoms as the back and headache of small-pox, the sore-throat of scarlet fever, the coryza and cough of measles, which symptoms precede the advent of the characteristic rashes. It is true that in the beginning of many cases of typhoid fever, there is diarrhœa and headache before the appearance of the rash; but though these symptoms point strongly to typhoid fever, yet they may be present at the commencement of acute tuberculosis, and, moreover, diarrhœa and even headache are often absent in typhoid fever. By the tenth or the fifteenth day the diagnosis in most cases becomes easy, still it must be admitted that now and then we encounter perplexing cases of typhoid fever, which for a much longer time render the diagnosis between it and tuberculosis or catarrhal pneumonia doubtful. The thirtieth day once passed, should the disease have remained so long undetermined, it is in all probability not typhoid fever, for this usually ceases either before or at this time. Yet it is well known that typhoid fever occasionally lasts six weeks, or longer. In children, the diagnosis between typhoid fever and acute miliary tuberculosis is often extremely difficult, the symptoms of typhoid being in some cases so ill-defined that many good observers refuse to consider them as denoting typhoid fever, and call such cases simple continued fever of children. Some of these cases are possibly cases of acute tuberculosis, the deposit ceasing and the tubercles becoming obsolescent and harmless. Of course the diagnosis is difficult then only when, in acute miliary tuberculosis and catarrhal pneumonia, there are neither physical signs nor characteristic symptoms. The recent serum test for typhoid promises to give us most valuable aid in the differentiation of typhoid from tubercle.

After typhoid fever, a period of fever may set in lasting six weeks or two months, the temperature becoming almost natural, then daily rising higher and higher to 101°, 102°, even 103°, and after about four or five days again gradually falling, this course being often repeated. Occurring after typhoid fever, such a temperature does not show lung disease. This condition co-exists with a clean tongue, increase of appetite and weight, and a steady amendment of the health.

It thus appears that, with some reservations, the temperature alone may enable us to diagnose phthisis in those cases where the physical signs and symptoms are absent, or are too indefinite to assist the diagnosis.

The following typical instances illustrate the usefulness of the thermometer in doubtful cases of phthisis :—

A patient is taken rather suddenly ill. His face is flushed, the eyes bright, the pulse frequent. The temperature is very high. There is no headache, no delirium, no diarrhœa. So weak is he that he stays in bed. At the end of ten or fifteen days he is found to be in much the same plight, but has grown weaker. His tongue has become dry. There are no typhoid spots, no diarrhœa, and the stomach is not distended. He has neither cough nor expectoration, and there are no physical signs in the chest. For a month or five weeks he continues in the same state, and then distinct physical signs appear at the apices of the lungs, accompanied by expectoration, and possibly by slight hæmoptysis. Soon he begins to improve, the fever grows daily less severe, the tongue becomes clean, appetite slowly returns, cough diminishes, and at last both cough and expectoration cease. All moist chest sounds disappear, and at the expiration of about two months the temperature becomes natural, strength returns, the weight increases, and to all intents and purposes the patient is well, although he may always carry evidences of consolidation at the apices of his lungs.

A woman between thirty and thirty-five years of age fails slightly in health, complains of slight weakness, is soon tired, but is never ill enough to be confined to bed. Her appetite is rather bad. There is a trifling cough, and perhaps on one or two occasions the expectoration of a slight streak of bright-coloured blood, so slight and so seldom repeated that it is hoped the blood may have come from the mouth or throat. There may be a strong family predisposition to phthisis. No physical signs are apparent, yet the temperature, rising nightly to 101° or 102° Fah., declares the true nature of the disease, which, perhaps, in the course of some months, decided physical signs render too evident. How important is it to detect this early and slight stage of the disease!

By means of the temperature, then, we may be able to diagnose tuberculosis, even when, during the whole course of the disease, there are no physical signs indicative of tubercular deposit in any of the organs of the body, and when the symptoms are quite inadequate to enable us to form such a diagnosis. This holds true in particular in respect of cases of acute miliary tuberculosis in children where, throughout the whole course of the disease, the only guiding symptom is preternatural heat of the body, with the exception, perhaps, of a small amount of sonorous or sub-mucous rhonchus, and yet after death most of the organs of the body may be found studded with miliary tubercles. We also occasionally meet with patients, generally among children of about ten or twelve years of age, who complain of pain in the head, and whose manner is peculiar, being semi-idiotic, in whom the temperature daily rises considerably for weeks or months, and after death small masses of yellow tubercle, the size of a large pea or bean, are found embedded in the substance of the brain, and sometimes miliary tubercles are found scattered through the thoracic and abdominal organs.

ON DROPSY

In health, nutritive plasma escapes from the blood-vessels into the adjacent tissues, and is afterwards absorbed by the lymphatics and veins. This transudation and absorption counterbalance each other, and hence only a moderate amount of fluid is found in the parenchymatous tissues. But if a disturbance arises in the balance between these two processes, the parenchymatous fluid increases, producing dropsy, or anasarca—a condition due either to too large a quantity of fluid transuding through the blood-vessels, or to deficient absorption. Nutritive plasma passes from the blood-vessels by filtration, diffusion, or the secretive attraction of the tissues for the fluid in the blood. Dropsy never probably happens through increased attraction of the tissues for the plasma, but in general results from an increased filtration. The amount of fluid escaping into the tissues by filtration depends on the difference between the fluid pressure in the blood-vessels and that in the parenchymatous tissues. In health the pressure of the fluid in the blood-vessels is higher than that of the fluid outside the capillaries, and hence a constant current of nutritive plasma flows from the blood-vessels into the tissues outside them.

Most cases of general dropsy depend on hydræmia, and this is produced by diminished action of the kidneys, the urine being greatly diminished in quantity, whilst the patient takes the same quantity of liquid into the system; the excess of the quantity ingested over that eliminated through the kidneys accumulates in the blood, and produces hydræmia, and, as Bartels has pointed out, the amount of the dropsy is, for the most part, in direct proportion to the diminution in the quantity of the urine. The inaction of the kidneys may be produced in three ways—by disease of the kidneys, *e.g.* Bright's disease, especially the acute and fatty varieties; by diminished arterial pressure in the glomeruli from general diminution of arterial pressure depending on heart disease; by retardation of the circulation through the kidneys from venous congestion due to tricuspid regurgitation.

In those forms of Bright's disease, the fibroid or the albuminoid, in which the quantity of urine is normal or even excessive, there is no dropsy, whilst in the acutely inflamed or fatty kidney, in both of which diseases the quantity of urine is often greatly lessened, the dropsy is often marked. The dropsy is most pronounced when the quantity of urine is notably diminished, whilst it is absent in those cases where the secretion of urine is free.

In emphysema, which by hindering the passage of blood through the lungs causes general venous plethora, the arteries are ill filled and the pressure within them low: the urine is consequently scanty. In all valvular affections of the heart, and in the weak heart pure and simple, less blood is propelled into the arterial system, and consequently arterial tension is lowered. Such, for instance, is the result of mitral and of aortic affections. In these cases, to overcome the obstruction to the circulation, the heart undergoes compensatory hypertrophy, and so long as this is adequate, so long is the arterial tension kept up; but the moment the compensation ceases to be complete, or that the left ventricle after hypertrophy undergoes degeneration and begins to fail, the arterial tension immediately begins to fall in the glomeruli as well as in the body generally. Now the amount of water that filters through the walls of the vessels in the glomeruli depends on the difference of lateral pressure inside and outside the blood-vessels. If arterial tension is much reduced, then less water filters through the vessels, and the water accumulates in the blood. But the quantity of urine depends not only on the degree of arterial tension in the vessels of the glomeruli, but also on the rapidity of the circulation through the kidneys. If arterial tension is lowered, then the rate of circulation also is reduced. But general venous congestion from tricuspid regurgitation also lessens the rate of the circulation by acting as an obstruction, and hence tricuspid regurgitation also tends to lessen the secretion of urine and to produce hydræmia. The lessened secretion of urine will accordingly result, in part, from the lowered pressure within the blood-vessels, in part, from the diminished rate of circulation: this latter will depend on two factors—lowered blood-pressure in the arteries, increased blood-pressure in the veins.

How does hydræmia produce dropsy? This question cannot at present be satisfactorily answered, but it is often assumed that the volume of the blood being increased, arterial pressure is augmented, and hence more serous fluid filters into the parenchyma; filtration is also supposed to be easier from watery than from normal blood. This view is not favoured by the foregoing, at least in so far as the dropsy of heart failure is concerned. Cohnheim finds that injecting water into the vessels of a dog will not cause dropsy unless the vessels themselves become altered, and he concludes that in anæmia and hydræmia the vascular walls do undergo change and favour the escape of fluid into the connective tissue.

Dropsy, then, is in proportion to the amount of hydræmia, and the amount of water in the blood is generally dependent on the action of the kidneys. We meet, however, with cases that at first sight appear exceptions to this statement, for we see patients troubled with extensive and progressive dropsy who pass two, three, or even four pints of urine daily; but it will generally be found that these patients are troubled with great thirst, and drink far more than they void through the kidneys or skin, and the excess of their drink over the quantity of urine accumulates in the blood, causing hydræmia and dropsy.

Are we right in asserting with some writers that mere venous obstruction cannot cause though it may favour dropsy, and that, without some affection of the nervous system, dropsy will not occur? In answer to this question the following experiment has been cited. The ascending vena cava in dogs has been tied without producing dropsy of the posterior limbs, but on cutting the nerves of the sciatic plexus, dropsy has immediately come on. Further, inasmuch as the division of the nerves inside the spinal canal (that is, before the vaso-motor nerves have joined them) does not produce dropsy, it has been concluded that paralysis of the vaso-motor nerves is the cause of dropsy (Ranvier). Clinical facts, however, certainly seem to prove that mere venous obstruction will cause dropsy; thus, cirrhosis of the liver, or a tumour pressing on the vena portæ, or coagulation in the vein as it enters the liver, will each suffice to produce ascites. Are we to conclude that these diseases also paralyze the vaso-motor nerves of the abdominal blood-vessels? I think not, and that we must admit that mere venous congestion may cause dropsy, though doubtless paralysis of the vaso-motor nerves will greatly favour it.

Is the venous congestion consequent on tricuspid regurgitation sufficient alone to cause dropsy, or is the dropsy chiefly due to hydræmia? Chiefly to hydræmia, for we meet with cases of extreme tricuspid regurgitation, with full, pulsating jugulars, much lividity and dyspnœa, and yet there is no dropsy. It will be found that these patients pass a normal quantity of urine, for when the urine diminishes dropsy sets in, and is in proportion to the scantiness of the urine. Still, no doubt, venous congestion from tricuspid regurgitation favours dropsy in other ways than by causing hydræmia, for distension of the right side of the heart, with general venous obstruction, must lessen absorption by the veins and lymphatics, and in this way cause the parenchymatous fluid to accumulate.

Remedies may remove dropsy:—(i.) By diminishing lateral pressure on the walls of the blood-vessels, and so lessening transfusion from the blood-vessels; (ii.) by increasing absorption; (iii.) by both ways combined; (iv.) by increasing the lateral pressure in the blood-vessels of the glomeruli, and so increasing the quantity of urine; (v.) by removing those diseased conditions of the kidneys which hinder their secreting action.

Digitalis affords a good example of a remedy acting by several of the foregoing methods. By its action on the diseased heart it obviates the effects of mitral disease, and more blood is sent into the aorta. Arterial pressure is thus raised in all the organs, and amongst other parts in the glomeruli of the kidneys, hence more urine is secreted, and the blood is purged of its excess of water, the dropsy becoming absorbed into the circulation, and quickly eliminated through the kidneys. But it also acts in other ways. By obviating tricuspid regurgitation, through its influence on the left side of the heart, digitalis will lessen or remove passive congestion, diminishing venous blood-pressure, and consequently filtration through the venules and capillaries, and thus it will reduce the amount of transfusion from the blood-vessels, and prevent further development of the dropsy. Again, by obviating venous obstruction it will remove lymphatic obstruction, and thus favour absorption by the lymphatics. Moreover, if there is much dropsy present, the pressure of the fluids outside the blood-vessels will, very probably, on removal of the congestion, become greater than the pressure in the vessels, and hence the fluids will flow into the blood-vessels. The water in the tissues is thus brought back into the circulation, and eliminated by the kidneys. When all the water has been absorbed from the tissues into the blood, and eliminated by the kidneys, digitalis no longer causes an excessive flow of urine; this should happen if it acted directly on the kidneys.

There is another form of dropsy needing description, viz., that due to anæmia. After severe loss of blood, or exhausting discharges of albuminous fluid, as in diarrhœa or chronic dysentery, a patient often becomes very dropsical. A small amount of dropsy at the ankles also is common in other forms of anæmia, such as chlorosis. How is this dropsy produced? It cannot be explained satisfactorily by ascribing it to hydræmia, for though in these cases the water of the blood is increased relatively to the amount of albumen and corpuscles, yet the total volume of the blood is diminished by the hæmorrhage, or discharge, and there cannot, therefore, be increased lateral pressure within the vessels, such as occurs when water is retained in the system from diminished excretion from the kidneys. It may, however, be advanced that though there is no increased lateral pressure within the vessels, yet the more watery nature of the fluid permits of a freer transudation.

From Cohnheim's experiments it is assumed that in anæmia the vessels undergo change and permit fluid more easily to transude through their walls.

THE EFFECTS OF COLD ON THE BODY

Before treating separately of the various kinds of cold baths, I think it will save repetition, and prove otherwise useful, to make some preliminary remarks on the effects of cold on the human body. These effects are various; thus, according to the way in which cold is employed, it is a refrigerator, an anæsthetic, a tonic, an excitant, or a depressant. Cold applied to the surface of the body, either as the douche or cold bath, affects the system generally, in a reflex manner, by its influence on the nerves; it also acts by abstracting heat.

The application of cold withdraws heat from the body, and cools both the superficial and the deep parts. The general cold bath will produce a very considerable reduction of the heat of the surface, to the extent even of 10° Fah. in the trunk, and of even more in the extremities. The general cold bath might be supposed to be capable of reducing the heat of the body's surface for a considerable time; this, however, is not the case, for the skin of the trunk speedily becomes warm again, although for some hours afterwards the extremities may remain cold; the temperature in the axilla, indeed, almost recovers itself in a few minutes, and it maintains itself although the bather may continue immersed for half an hour, or even longer, in water at a temperature of 60°.

Of course, it is not here suggested that heat is not abstracted from the body, but, as will be shown in another place, the loss which does obtain is so rapidly restored that the cold bath does not depress the skin's temperature in a healthy person for any notable time.

Cold sponging, so often employed in fevers with such evident relief, exerts a comparatively slight and transient influence on the heat of the body, as may be ascertained by aid of the thermometer; hence the sense of comfort derived from the sponging cannot be ascribed wholly, or even appreciably, to its refrigerating influence. The relief felt may be due to the removal of impurities which perhaps irritate the skin, or annoy by their odour, and to the mitigation of the parched condition of the surface; for a skin both dry and hot is a source of much greater discomfort than one which is moist even though it be actually hotter. Sponging with tepid water, so as to restore moisture to the parched skin, hence gives marked comfort to the patient.[1]

The foregoing remarks apply only to the surface of the body, but the general cold bath will likewise reduce the temperature of the internal organs. This reduction, never very great, is restored to the deep even more quickly than to the superficial parts, so that, as might be inferred, the general cold bath is still less efficient as a refrigerator of the internal than of the superficial organs. In fever-free persons, therefore, the general cold bath must rank very low as a refrigerator.

It is, however, otherwise with the body of a patient whose temperature is unnaturally raised by fever. The immersion of fever-stricken patients in the cold bath, or the packing of them in the cold sheet, may produce a considerable and durable lowering of the temperature. To what extent this reduction is effected by abstracting heat or by preventing its unnatural liberation, it is impossible at present to decide.

The application of cold first contracts the blood-vessels of the skin; this it does partly by a direct topical action, but chiefly by a reflex action through the vaso-motor system. On discontinuing the cold the vessels dilate, and the surface becomes redder, warmer, and glowing. The vessels of distant and internal parts are similarly affected, as experiments have shown in the case of the mesentery and the membranes of the brain (Schüller, Frank). Winternitz maintains that he has proved experimentally that it is possible to control the effect of cold and direct and localize its influence; he finds that cold applied to the foot affects chiefly the intra-cranial circulation; cold to the thigh, the pulmonary circulation; and cold to the back, the circulation of the pituitary region, *i.e.* the nasal mucous membrane.

The moderate and brief application of cold not only heightens arterial tension, but likewise increases the frequency of the heart's action, and if this practice is continued daily, it increases the corpuscular richness of the blood, and the hæmoglobin of the corpuscles, and it removes anæmia. It thus stimulates the functions of the whole body.

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[1] The effect of sponging as a means of cooling will depend very much upon the freedom with which it is performed. If the patient be placed upon a macintosh, and the whole surface liberally wetted, a much more pronounced effect upon the temperature will result.

Cold, when judiciously employed, is well known to be a powerful tonic. A cold climate and cold bathing are tonic and bracing. The theory of the tonic action of cold may perhaps be stated thus:—During exposure to cold, the body's loss of heat, as tested by the thermometer, is by no means a measure of the quantity withdrawn. Many observers have shown that at such times increased combustion occurs, whereby much of the lost heat is compensated for, and the temperature maintained or soon restored. This increased oxidation of the tissues is demonstrated by the greatly increased quantity of carbonic acid thrown off by the lungs on exposure to cold. Now the most vigorous health is maintained by a rapid construction and destruction of tissue, within certain bounds, provided that these two processes are fairly balanced. On exposure to cold, the lungs absorb more oxygen, the tissues are more rapidly and freely oxidized, and the processes of destruction and reparation go on in larger measure. How is this effected?

In the process of nutrition, we have three factors present, the nutritive plasma, the tissues, and oxygen. When food is taken, digested, and introduced into the blood, both construction and destruction of the nitrogenous tissues begin, but construction is limited by destruction; and when the destruction of tissues ceases, the further building up of the nutritive materials of the blood comes likewise to an end. These destructive changes take place in proportion to the amount of oxygen absorbed, and when this gas is exhausted, they cease, many products of destruction remaining only partially oxidized; at this time integration is suspended (Parkes).

Under exposure to cold, oxygen being more abundantly absorbed, the effete products in the blood are first consumed, the blood being thus purified and rendered fit to nourish the body; next, by its consuming action upon the tissues, oxygen promotes the cycle of changes just described, and food being taken is assimilated, and the destruction and construction of the tissues go rapidly on; in this manner great physical vigour results. Thus it is that cold climates are invigorating.

Applied locally, cold may act as a tonic (see Douche); but if too long continued, or too excessive, it depresses; for, by contracting the vessels too continuously, or too intensely, it lessens the supply of blood to the tissues, and thereby diminishes their cell-growth and tissue change. Intense cold, applied for some minutes, will abolish sensation, and acting in this way, cold serves as an anæsthetic; if the cold is too long continued or too intense, the part will die and become gangrenous.

The sudden partial application of cold may act reflexly as an excitant: a cold hand applied to the abdomen excites contractions in the parturient womb; cold water smartly sprinkled on the face of a swooning person is a familiar way of restoring consciousness. The same treatment will help to establish breathing in weak or apparently still-born children, or to recover persons over-dosed with chloroform, or narcotized by opium or tipple.

The local application of cold may affect deep-seated vessels reflexly. Rossbach finds in his experiments on animals that the application of an ice-bag to the skin, as of the abdomen, affects the vessels of the trachea, the mucous membrane becoming first pale; this is followed soon after by a slight redness, passing later into a blue-red tint, upon which a copious watery secretion ensues. Here, then, we have an instance of the induction of venous congestion by the local application of cold, and, as Brunton remarks, these experiments explain "how readily a draught of cold air on some part of the body may cause inflammation of the respiratory organs."

Experiments on cold-blooded animals show how greatly temperature modifies the action of drugs on voluntary and cardiac muscle, on motor and secretory nerve, on the spinal cord, and probably on all tissues. As a rule, poisons act more energetically on frogs in hot than in cold weather: a dose sufficient to produce great effect in hot weather being inoperative in cold. Brunton finds that great heat or great cold prevents the action of veratria on voluntary muscle, and I find that heat greatly increases the susceptibility of the heart and of the skeletal muscles to veratria and otherwise modifies the action of this drug.

Luchsinger shows that temperature influences the motor nerves, for he finds that extremes of temperature abolish the action of guanidine on the motor nerves.

Temperature also modifies secretion, probably by its influence on the secretory nerves, for pilocarpine acts less on animals whose temperature is reduced by placing them in a cold chamber (Brunton), and it is well known that this drug acts much more powerfully when the patient is in a warm bed or before a fire than if the skin is exposed to cold.

Some poisons, like chloral, alcohol, etc., act in part by reducing the temperature of the body, by a lessened combustion, and by so disturbing the mechanism which regulates the production and loss of heat, that the temperature is more quickly raised or cooled by the application of heat or cold (Brunton). In such cases, by maintaining artificially a proper temperature of the body, we may avert death.

THE COLD BATH, INCLUDING SEA-BATHING

COLD water may be applied for the sake of its moisture, its temperature, or both conjoined. If we require merely moisture, and temperature is of no consequence, tepid or warm water is preferable and more agreeable. Cold water is generally employed to abstract heat from either the whole surface of the body, or from some particular part of it, or to induce general or local excitement by its shock.

Since the skin absorbs neither the water of the bath, whether it be warm or cold, nor any substances, soluble or insoluble, which may be added to the water, it follows that whatever may be the effect of baths it must be explained by a direct topical action on the skin.[1]

In speaking of the general cold bath we shall speak mainly of cold sea-bathing, this being a far more powerful agent than the simple cold bath, although, qualitatively, the action of the two is identical, the difference in their effects being one of degree merely: as we proceed we shall point out how these differences affect the body.

On entering a cold sea-bath there is at first a sensation of depression, great or little, according to the coldness of the water. The skin becomes pale and shrivelled, and presents the familiar appearance known as "goose-skin," a condition produced by the contraction of the skin, and the consequent protrusion of the hair-roots and follicles. There is a general shivering, some blueness of the lips, nose, and extremities, considerable reduction of the temperature of the skin, quickened pulse, convulsive and sobbing breathing as the water rises to the chest, especially when the bath is entered slowly. The system soon becoming roused to meet and to resist the depressing effects of the cold, there ensues in a few seconds a sensation of general exhilaration. The skin becomes ruddy and glowing, the breathing full and easy, the pulse rather quick but strong, the spirits exalted, and the bather feels increased vigour, both of mind and body. If he quits the bath now, or before the period of exhilaration ceases, the buoyant condition endures more or less for the rest of the day, showing that the bath has acted as a tonic to the system.

On the other hand, if the bath is prolonged, depression again comes on. The bather feels cold, shivers, becomes blue and numb in the more exposed and smaller parts, whence, on account of their small size, warmth is more readily withdrawn, and he is seized with a sense of depression and wretchedness. Baths prolonged to this injudicious extent often produce damaging results, which may continue for hours, and even days, sometimes, indeed, inflicting serious injury on the health, especially of weak or growing persons. For many hours after the bath there may be general languor, with a repugnance to exercise, whether of body or mind; the bather's temper is fretful and morose, the circulation feeble and languid, he complains of sinking at the epigastrium, loss of appetite, chilliness of the surface, and cold extremities. It need scarcely be said that consequences like these are to be carefully avoided, yet these risks will often be encountered unless the doctor gives specific and minute directions, so great is the prevailing ignorance and error on the subject of bathing.

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[1] Gases, *e.g.* sulphuretted hydrogen, are probably absorbed to some extent by the skin from the water of the bath.

If the exposure in the cold bath is continued beyond this point, or if the cold is severe, its effects become more manifest; great depression and a sense of utter misery set in, followed shortly by heaviness and drowsiness, which deepen sometimes into coma; a kind of apoplectic state is now reached, which may end in asphyxia and death from paralysis of the muscles of respiration.

Baths, then, on the one hand, judiciously employed, are very powerful tonics, while on the other hand, if unwisely used, they induce great depression of the bodily powers and produce serious mischief.

The superiority of sea-baths has been placed beyond mere surmise, for direct experiment has established the fact that a sea-bath acts far more powerfully on tissue metamorphosis than the simple water-bath. While the sea-bath increases the process both of destruction and of construction of tissue, yet that of construction is in excess of that of destruction, and so there results not only increased vigour of the functions of the body, but an actual augmentation of its weight. Sea air, it is true, acts in the same way, so that it is difficult to determine to what extent improved health results from the sea climate or the sea-baths.

The cold bath is almost universally employed for its tonic virtues. To obtain this wished-for result the bath should be discontinued at the time it causes general exhilaration, for the system then appears to be roused into action to resist the depressing influence of cold, and if at this point the bath is discontinued the general healthful stimulation persists; for whilst taking the bath, and probably for some time afterwards, oxidation of the tissues is increased, the blood is purified of effete products, and the processes of construction and destruction of tissue, on which vigour of both mind and body depend, are intensified.

Bathing therefore increases appetite, improves digestion and the assimilation of food. The bath is hence a tonic in the strictest sense of the word.

Used in accordance with the rules to be immediately laid down, the good effect of the bath soon becomes apparent, and the patient gains in weight, his complexion becomes ruddy and clear, his muscles, especially if he conjoins exercise with the baths, acquire firmness and strength, the mental debility arising from deficient nutrition of the nervous system speedily passes away, and he soon recovers mental and bodily vigour.

The important question arises—How can we best obtain these invigorating effects?

Our object, clearly, is to secure the greatest possible amount of stimulation, and to ensure as long as possible the persistence of the increased vitality thereby produced. To obtain the greatest degree of stimulation we must duly apportion the temperature and duration of the bath to the patient's strength, and to ensure the continuance of nutritive vigour as long as possible the patient should leave the bath at the climax of general exhilaration and stimulation, avoiding carefully the onset of the next stage, that, viz., of depression.

The bather, if very weak, manifests but little functional energy to resist the depression from the cold. Indeed, if this is intense the stage of stimulation may not come on at all, but, depressed from the first, the patient may so remain for a long time. Injudicious bathing often seriously injures and even endangers the lives of weakly persons.

The depressing effects of a cold bath are proportioned to its coldness and duration. The colder the water the greater the depression it occasions—this is greater, too, when the water is in motion than when at rest. Again, the longer the period of immersion the greater is the degree of depression.

When the patient is weak and prostrated by illness, the bath must not be too cold, nor continued too long, and the water should be at rest. Thus, we must have regard to the strength of the patient, the temperature of the water, and the duration of the bath.

Here it will be convenient to consider in what respect sea-baths differ from simple water-baths, and to explain the tonic superiority of sea-baths.

1st. In sea-water various saline ingredients are held in solution.

2nd. The variations in temperature of sea-water, in the varying seasons of the year, are much less than those of river-water.

3rd. While the sea is always more or less in motion, river-water is comparatively at rest.

The salts in solution in sea-water are supposed to act as invigorating stimulants to the skin, and hence a patient unable to bathe in simple water without suffering great depression can bathe in sea-water with great benefit. Moreover, as the sea's temperature never falls very low in winter, sea-bathing may often be continued late into the autumn, or even into the early winter months.

The motion of the waves increases, it is true, the depressing effects of the bath, but if the bather is strong enough, it also increases the ensuing reaction, and thus the commotion of the waves is to the strong highly exhilarating.

These guiding principles borne in mind, we shall be able under all circumstances to give correct answers to the various questions patients may put to us concerning bathing. One most frequently asked is —How long shall the bath be continued?

Our answer must be regulated by the strength of the patient and the coldness of the water. If the water is cold, or the patient is very weak, we must at first forbid out-door sea-bathing and substitute a tepid bath, the temperature of which should be slowly reduced until that of the sea is reached. Then, if the day is fine and the sea calm, the bath may be taken in the open air. Though it may be considered safe to let the patient bathe in the sea, yet if he is very weak and unaccustomed to bathing, his stay there must be very brief; it will often suffice to allow two or three waves to pass completely over him, when he should at once come ashore and wipe himself thoroughly dry, using plenty of friction to the skin, for which purpose Cash's towels are well adapted. With increasing strength, and on becoming accustomed to the effects of the water, he may continue the bath for a longer time, but it is seldom advisable for a convalescent to bathe longer than from five to ten minutes. Some patients, nay, even some healthy persons, can bear a sea-bath only every other day.

Then as to the time of day best suited for bathing the greatest ignorance prevails, before breakfast being currently believed to be the best time, yet this practice is not without risk, even for the robust, who are often made ailing and fatigued by it for the rest of the day.

Our object in using the bath, as we have before said, is to obtain energetic stimulation and vigorous and prolonged reaction. We must therefore choose that time when the body is most refreshed, invigorated, and nourished. These conditions, it might be supposed, would co-exist in the early morning, after a sound and refreshing sleep. It must be borne in mind, however, that before breakfast the body has undergone a fast of several hours, and is in want of food, without which the bodily functions may very readily become depressed. In point of fact, only a robust person is able to bear a sea-bath before breakfast. Thus theory and practice are both opposed to this period for bathing, and both point to a time between breakfast and dinner as the most appropriate.

This leads us to the consideration of another question; namely, how long a time should pass, after a meal, before a bath may be taken; and, after a bath, what time should pass before taking food? Now cold bathing causes a great shock to the skin and system generally, and any powerful mental or bodily impression will suffice to check or even arrest for a time many of the functions, even though these be already in active operation. This is the case with digestion. Any great excitement, it is well known, can stay this process more or less completely, and in like manner the bodily shock of the cold bath is generally sufficient to arrest it entirely; before the bath, therefore, an adequate time should elapse, so as to permit the almost complete digestion of the breakfast, that is, an interval of about three hours. Nor, for the reasons just pointed out, should the bath be taken immediately before a meal, for otherwise, little or no gastric juice will be secreted, and the food will lie half-digested in the stomach.

For a reason somewhat similar, the bather should not go into the water whilst under the influence of any great emotional excitement. The nervous force (to which there appears to be set a limit) being directed strongly into one channel, the bath will not be able to utilize it and to procure a vigorous reaction, and hence the patient will feel languid, cold, shivering, and depressed. Obviously, for the same reason, children must be coaxed, not dragged into the water against their will. In early life there is often much terror of bathing, and if, in spite of this, the child, while screaming with fright, is forcibly dragged into the sea, very ill effects may follow; for, missing the stage of stimulation, the child may remain, often for days, depressed and ill.

Is there any age rendering sea-bathing dangerous and to be prohibited?

It is generally accepted that young children—say under two years of age—being very impressionable, ought not to undergo the shock of a cold sea-bath. At the other extreme of life, when the enfeebled powers of the body are incapable of strong reaction, sea-bathing is inadmissible, for it is as well known that in old people the heat-forming powers are much reduced. Moreover, undue vascular excitement may in them prove dangerous; the vessels in the aged, often brittle, through degeneration, being in danger of giving way, and hence under any unusual strain apoplexy may happen.

The foregoing remarks imply that fatigue is a condition strongly adverse to cold bathing. Even if other conditions are favourable, it is seldom advisable for weakly persons to take a bath on the day following their arrival at the sea-side. They should wait till all fatigue has passed away.

Does pregnancy forbid sea-bathing?

If a woman has miscarried or aborted, or if she is of an excitable temperament, baths may be expected to do harm, and in far advanced pregnancy a sea-bath may perhaps produce abortion. But under other circumstances, and with due regard to the conditions previously laid down, bathing will benefit both mother and child.

With regard to menstruation, if a woman is accustomed to bathing, she need not discontinue the practice at the menstrual period, although it is always inadvisable to begin at such a time, since the shock may check or arrest the flow, and thus induce, perhaps during many months, amenorrhœa.

In the choice of coast, and the time of year, we must have regard to the condition of the patient. If not very weak, and the health is but little undermined, then a rugged coast, where the sea is rough and boisterous, may be recommended. However, should the health be much broken, then a smooth sea is preferable, and, in a cold climate, the summer is the only suitable time.

Exercise taken while bathing soon induces fatigue and even exhaustion, wherefore weakly patients must be cautioned to be moderate in this respect. Another evil should be guarded against: on leaving the bath, a patient invigorated by it is in danger of taking too much exercise, fatiguing himself, and so counteracting the bath's good effect. The amount of exertion permitted must be strictly in accordance with the patient's condition, who, if very weak, should take only horse or carriage exercise.

A course of sea-bathing sometimes causes the hair to fall off abundantly, naturally exciting much anxiety, especially in women. Their fears, however, may be quieted by the assurance of a rapid new growth. Other troubles may arise. Bathing sometimes induces constipation, more or less obstinate, but this need not lead to the discontinuance of the bath. The constipation should be removed by exercise, regulated diet, or, these failing, by purgatives. Dyspepsia and diarrhœa also sometimes occur during sea-bathing. The bather, in such case, should be discreet as to the hour of the bath, the time spent therein, and if, notwithstanding every care, dyspepsia or diarrhœa continues, the bath must be temporarily or permanently discontinued. It must be borne in mind, however, that sea air alone will, in some constitutions, induce these disorders.

Restlessness at night is sometimes attributed to sea-bathing. Many people, no doubt, find that living too near the sea-shore produces broken and sleepless nights. On the shores of the Mediterranean, especially along the Riviera, this is notably the case. On removal inland, a mile or thereabouts, this restlessness vanishes: for instance, sleep unattainable at Cannes itself is secured at le Cannet, a mile or so inland. Broken rest may, however, be traced to many causes, *e.g.* dietetic irregularities, too late hours. A late and heavy meal will thus sometimes cause restlessness, whilst a good night will follow an early, light, and digestible repast; on the other hand, some people are kept awake for want of something in the way of food taken before retiring. Some patients mar their rest by taking stimulants shortly before bedtime, while, on the other hand, others cannot sleep without a "nightcap." Hence, before referring an insomnia to sea-bathing or sea air, we should make sure that no other simple cause is present.

A bather should plunge into the waves at once, and on no account stand undressed and hesitating till he become cold and shivery. It is a common and pernicious error to suppose that it is necessary to be well cooled down before plunging into the bath. If needful, indeed, a short, brisk walk should be taken just before the bath, to warm the surface and extremities.

The immediate effect of cold, in proportion to its degree, is to lessen the perspiration. A cold bath at first checks perspiration, but soon afterwards this secretion becomes considerably augmented, and in a greater degree after sea than after simple water bathing.

Upon the kidneys we must record another effect: driven from the skin, in the first instance, the blood flows into and fills the internal organs, and the kidneys partaking of this congested state, there arises the frequent and transitory occurrence of a small quantity of albumen in the urine during the bath, at least this is the probable explanation of a matter of fact.

The effects of cold baths on tissue change have already been pointed out, and the observations on this subject will be supplemented and confirmed by those we have now to make relating to the influence of sea-baths on the constituents of the urine. Baths augment the quantity of the urea and sulphuric acid of the urine. Whether this increase exceeds the limits of the natural healthy variations, or whether the experiments are sufficiently numerous to prove the statement, has been called in question. It is not, however, to be expected that the tissue change would at once be greatly augmented, or that the increase at any time would exceed the maximum of health; consequently the increase of urea in its turn should not exceed the maximum quantity excreted in health. But surely, if for some time the excretion of urea is maintained at its maximum, this single fact alone would establish the influence of baths, so far as they could be expected to operate, and would show that sea-bathing increases disintegration of the nitrogenous tissues.

Beneke's observations have led to the same conclusion: when food was taken, just sufficient to maintain the weight of the body at a fixed point, he found that baths immediately reduced the weight of the body, a loss certainly due to heightened disintegration of the tissues. But when an extra supply of food was allowed, to satisfy the increased appetite caused by the increased consumption of the tissues, then by means of an improved assimilation the body gained in weight. Baths have been said to increase the quantity of uric acid, although this is stated to be lessened by sea air: but on this point observations are as yet insufficient.

The urinary water is temporarily and often greatly increased by the bath, though the whole day's urine may be lessened in quantity, probably owing to a subsequent excessive elimination by the skin. In Beneke's observations the intestinal secretions were also augmented, and some of the water which the kidneys would else have secreted may have escaped in this way.

It is scarcely necessary to occupy much space with a narration of the cases likely to derive benefit from sea-bathing. In chronic illness, attended by debility, sea-bathing yields the best results, but it is especially useful to those recovering from acute diseases, and to persons whose health has been broken by over-work, by residence in ns, by sedentary employment, or by injurious excesses. It is a question of much importance whether phthisical persons should take sea-baths, and our answer must be qualified by the circumstances of each case. When the disease is chronic, with little or no elevation of temperature (little or no fever), when, indeed, the case is one of fibroid infiltration of the lungs, without active formation of tubercle, sea-baths may be permitted, due regard being paid to the rules just laid down.

When the cold bath or cold sponging cannot be borne, it is often useful to rub the body vigorously with a towel wrung out of tepid or cold water, or the naked patient may have a sheet, wrung out of cold water, thrown over the shoulders, and be rubbed down with the sheet. This plan is useful to prepare the way for the cold sponge-bath, and is applicable to the same class of cases, since it excites reaction and produces tissue change and stimulates digestion; like the sea-bath, it is a true tonic. It is useful also, to relieve fatigue after a hard day's walk, etc.

THE SITZ-BATH

THE sitz-bath is largely and beneficially used in hydropathic institutions. The water should be between 60° and 80°, and the patient should sit in it from five to thirty minutes, once or twice a day. At first it causes contraction of the arterioles, not only of the immersed skin, but also of the intestinal vessels, and hence more blood is sent to the head and upper extremities. After the bath is discontinued the reverse process sets in, more blood being sent to the abdominal organs, and a diminished supply flowing to the brain. The sitz-bath greatly relieves fatigue and soothes an irritable, restless state of the nervous system. It likewise often lessens headache, and by lessening the amount of blood in the brain, it is in many instances usefully employed to procure sleep. By its means the bowels may be regulated —further, it often serves to augment the catamenial flow. After the sitz-bath reaction should be promoted by friction or exercise.

ON PACKING WITH THE WET SHEET

PACKING with the cold wet sheet, although at present seldom employed outside hydropathic establishments, is undoubtedly, in many diseases, a very efficacious treatment.

Dr. Johnson, in his work on hydropathy, directs first the preparing of a mattress with a pillow to support the patient's head; then "upon the mattress, and extending over the pillow, two blankets are spread, and over this a sheet wrung out, as dry as possible, of cold water. The patient lies down on his back, perfectly unclothed, with his head comfortably placed on the pillow; an attendant now approaches, say on the patient's left, and first puckering the blankets[1] from the back of the head down to the back of the neck, reaches across the chest, seizes the right upper corners of the blankets, and brings them tightly across under the chin to his own side (the left), and tucks them well and evenly under the left shoulder, where it joins the root of the neck, and under the point of the same shoulder. He now reaches across the body again, and brings over all the rest of the right sides of the blankets to the left side of the patient, and then proceeds to tuck them well and evenly under the left side, beginning where he left off, at the point of the shoulder, and proceeding quite down to the heels. The patient is now entirely enveloped in one half of the blankets, and the attendant finishes the operation by passing over to the right side of the patient, and then proceeding to tuck the left sides of the blankets under the right side precisely in the same manner as we have seen him tuck the right sides of the blankets under the left side of the patient. The attendant, standing on the right side of the patient's legs, finally insinuates his left hand under the backs of the ankles, lifts them up, and then with his right hand turns back the lower ends of the blankets under the heels." The wet sheet should reach to the ankles, and "be wide enough to overlap in front of the body about eight or twelve inches: over the whole four or five blankets are placed, and pressed down close to the sides."

This pack is useful in specific fevers and acute inflammatory diseases. It has long been employed in scarlet fever, and should be used from the beginning and throughout its course. In moderate attacks it is sufficient to pack the patient from thirty to fifty minutes; but if the fever is very high, if the rash comes out slowly, imperfectly, and of a dull colour, if the patient is restless and wandering, the packing must be continued an hour or longer, and be repeated three or four times a day. This treatment develops the rash, greatly reduces the fever, quiets the pulse, renders the skin moist and comfortable, and abates the restlessness and wandering. A short time after the application of the wet sheet, a patient, previously restless and wandering, will often fall into a quiet refreshing sleep, and awake calm and free from delirium. Its influence on the pulse and temperature is striking, the pulse in a few hours falling fifteen to twenty beats in the minute; a repetition of the packing greatly reduces the fever. The packing is especially indicated on suppression or recession of the rash, when serious symptoms are apt to arise; the cold sheet will then bring out a brilliant rash, followed, generally, by immediate improvement in the patient's condition. It has been recommended to dash two or three pailfuls of cold water over the patient after each packing. During the whole course of the fever a cold wet compress, renewed every three hours, should be worn round the throat, and if, on the decline of the fever, the tonsils remain large, or there is chronic inflammation of the fauces or larynx, this application, renewed less frequently, or applied only at night, should be continued till these morbid conditions cease. The compress should be composed of linen, several times folded, and fastened round the throat by another piece of folded dry linen. Cold packing is beneficially employed in other fevers, and in acute inflammations, such as measles, small-pox, pneumonia, pleurisy, rheumatism, and gout.

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[1] Before dealing with the blankets the patient will have been quickly enveloped in the wet sheet upon which he has laid himself.

In acute rheumatism, when the pain forbids the patient to be moved, the front of the body only should be packed, and a wet cold compress, renewed every two or three hours, should be wrapped round each of the painful joints. If the prejudices of the patient's friends prevent the use of the cold sheet, the body should be sponged with tepid or cold water several times a day, and if the perspiration is abundant and foul, soap should be used. In addition to sponging, the wet cold compress, as previously described, should be applied to the painful joints. There can be no question as to the superiority of this treatment over that of swathing the patient in flannel clothes, and covering him with blankets to make him sweat. To avoid the supposed danger of catching cold, these woollen clothes are worn day after day, till, saturated with putrefying perspiration, the stench sickens and de-appetizes the patient, and a crop of irritating miliary vesicles is engendered, which breaks the patient's sleep.

In pneumonia some pack the chest only, and renew the cold applications hourly, or even oftener; a mode of treatment which is said to remove the pain, quiet the pulse, calm the breathing, and reduce the fever.

When, as often happens, the patient's friends object to the cold packing through fear of "inflammation," or of "turning the disease inwards," the sheet may be wrung out of tepid water, and by the time it is spread for the reception of the patient it will be sufficiently cool to answer the purpose.

A pedestrian, after great exertion, will find it an agreeable restorative, preventing stiffness and aching of the muscles, to strip and wrap himself in a dripping-wet cold sheet, well rubbing himself afterwards; if stiffness still remains, a few drops of tincture of arnica taken internally will remove it.

Cold or tepid packing is useful in the summer diarrhœa of children.

A daily cold wet pack is often a very useful application in chronic diarrhœa, like that often met with in persons coming from a tropical climate, and due probably to chronic catarrh of the intestinal mucous membrane.

In insomnia the wet pack is often a means of obtaining sleep when drugs are powerless. In states of great excitement, with restlessness, as in the delirium of fever, also in certain cases of insanity with maniacal excitement, the wet pack is most useful as a means of quieting the patient. Carefully applied and carefully watched, there is no danger in these applications, and a double purpose is often served, for the wrappings act as a most efficient means of mechanical restraint in its mildest form. Applied roughly, and then left for the patient to twist and distort by his writhings, the application is a dangerous one, and it is in this way that discredit has come upon a valuable therapeutic agent in maniacal states.

The same rules govern the use of the wet sheet as of the bath, viz., *the less* the powers of resistance in the given case before us, *the shorter* should be the application, and in the very weak and exhausted it is often advisable to wring the sheet out of hot water and apply quickly before it has time to cool much. If after any of these uses of water the extremities remain cold, the treatment is not successful.

THE DRIP SHEET

As an application allied to the wet pack, and described by Weir Mitchell as a remedy past praise in many cases of insomnia, we may here describe its mode of employment:—In a basin of water at 65° Fah. (the temperature may be lowered day by day till 55° or even less is reached) a sheet is placed with the corners hanging out for convenient seizing; the patient stands in one garment in a bath of comfortably hot water, and round his head, turbanwise, a large soft towel, wrung out of iced water, is wound; the patient's covering is removed, and the attendant, standing in front, seizes by its two corners the wet sheet and throws it around the patient, who takes hold of it at the neck; a rough, smart rub from the outside applies the sheet everywhere; this takes but two minutes or less; the sheet is now dropped, and the patient lies down on a blanket spread out upon a lounge, and is wrapped up in this; thorough drying with a coarse, rough towel now follows, a dry blanket is substituted, and now the head-wrap is removed and the hair thoroughly dried; the nightdress is then put on, and the patient gets to bed, and the feet are enveloped in a flannel wrap. The results which are obtained are worth all the trouble taken according to Weir Mitchell. He adds that if this fail a pack may succeed.

COLD BATHS IN FEVERS

THE elaborate investigations regarding the action of cold applications in fevers, made in Germany especially, induce me to devote a separate chapter to this important subject.

These investigations confirm the conclusions of Currie and Jackson, and give precision to our knowledge concerning the application of cold to the surface, and its effects. This treatment has been employed in typhus, typhoid, and scarlet fevers, measles, and other febrile diseases. More recently, Dr. Wilson Fox and others have by this means cured patients suffering from the hyperpyrexia occasionally observed in rheumatic fever, a condition, owing to its sudden onset and rapid course, hitherto regarded as almost necessarily fatal.

Many of the symptoms, and dangers, of fevers, depend in great measure on the elevation of the temperature. The effects of fever, whether specific or inflammatory, are due either to elevation of the temperature, to the specific cause of the fever, or to the local inflammation. The symptoms common to all fevers are due simply to the elevated temperature of the body, whilst the characteristic, *i.e.* specific, symptoms are due either to the specific poison or to the local inflammation. The increase of temperature affects the organs in a twofold manner: in the first place, it perverts, depresses, or, if the rise is very high, abolishes function; in the second place, it produces fatty, or, as it is termed, parenchymatous degeneration of all the tissues.

That the common symptoms of fever, such as headache, delirium, quick pulse, dry skin, and general weakness are due to the heightened temperature is well shown by the effects of a treatment which is able to reduce this abnormal temperature, for if by the aid of the cold bath or by quinine we lower the temperature to the normal standard, these pyrexial symptoms at once disappear.

Fatty degeneration of the tissues sets in during the progress of a fever, especially when prolonged. This degeneration has been observed more particularly and fully in the liver, kidneys, heart, blood-vessels, and voluntary muscles. It is in all probability due to the pyrexia, for the degree and extent of the changes correspond to the degree and duration of the elevation of temperature; similar changes occur when the temperature of an animal is raised artificially by keeping it in a warm chamber. Under these circumstances the cells of the liver and kidneys become first cloudy, then granular, finally the nucleus becomes obscured, and the entire cell distended with granules, which appear to be the precursors of fat droplets, by the accumulation of which, ultimately, many cells burst and perish. The muscular tissue of the heart and of the voluntary muscles becomes granular, then fatty, and in severe cases their fibres undergo extensive destruction.

These effects of high temperature can obviously be combated only by means which lower the temperature and prevent the further undue development of body-heat. Foremost amongst these means must rank cold baths. Employed early enough, they obviate the immediate depressing effect of the temperature on the tissues, and prevent the oncoming of parenchymatous degeneration. Thus they strengthen the heart, with reduction of the frequency of the pulse, and so avert the danger of failure of the heart, and of hypostatic congestion. They tend likewise to prevent delirium, and to produce sound and refreshing sleep, to improve digestion and assimilation, and to promote the general nutrition of the body, and thus to ward off or to lessen the risk of bed-sores and exhausting suppurations. The period of convalescence is shortened, though some deny this, by the promotion of assimilation, and the prevention of parenchymatous degeneration. It is true that the specific poison of some fevers, as typhoid or typhus, will itself probably, in some degree, affect the heart, brain, and functions generally, but that their depression is mainly due to the elevated temperature is shown by the great abatement of the symptoms referable to these organs, when the temperature is reduced. True, it may be plausibly urged that without elevation of temperature the specific poison cannot be formed, and hence anti-pyretic treatment will likewise obviate its depressing effects.

Cold bathing is applied in various ways—by means of the general cold bath, affusion, packing, sponging, and by the use of ice.

Brand, to whom the revival of this hydropathic treatment is chiefly due, has employed it largely in typhoid fever. In mild cases he uses cold wet compresses, or frequent washings with cold water, or repeated packings in a cold wet sheet, or a warm bath gradually cooled. In severe cases he recommends affusion, the shower-bath, or the general cold bath. He generally places the patient in a sitz-bath, and pours water of 50° to 55° Fah. over the head and shoulders, for ten or fifteen minutes, wraps him afterwards unwiped in a sheet, and covers him over with a coverlet, and to his chest and stomach applies compresses wrung out of iced water; but if the patient complains of the cold he covers the feet more warmly or applies hot bottles to them.

Hagenbach employs a general cold bath of 68° to 77° Fah. for ten cr twenty minutes, and if there is much delirium, or coma, he at the same time pours cold water over the patient's head. He disapproves of the frequent cold washings and packings, asserting that they abstract but little heat, and that they fatigue the patient.

The method employed by Ziemssen and Immerman is the most agreeable to the patient, and being equally efficient, it is the treatment most likely to be generally adopted. They immerse the patient in a bath of 95° Fah., and in the course of twenty to thirty minutes gradually cool it to 60° by the addition of cold water. This bath is agreeable to fever patients. These observers do not employ affusion, since the patient dislikes it much, nor do they use cold compresses, since these do not affect the rectal, *i.e.* deep, temperature. They find, however, that cold packings do reduce the temperature of the rectum. For young children and old persons the severity of the application must be apportioned to the strength of the patient. Brand wraps a child in a wet sheet, and placing it on a table pours cold water over its head. For children and the aged Hagenbach employs for half an hour a warm bath, gradually cooled by the addition of cold water to 86° or 75° Fah. Weakly patients should be well rubbed on leaving the bath. Hagenbach adopts this treatment whenever the temperature rises above 102° Fah., while Brand recommends it whenever the temperature mounts above 103° Fah. Friction over the whole surface of the body by rubbing with the hand during the continuance of the bath appears to add considerably to the value of the treatment. By this means the circulation is quickened and the vascular tone improved.

In private practice I find the assiduous application of cold cloths wrung out of ice-cold water more convenient than the use of the general cold bath. This plan, if effectually carried out, promptly reduces the temperature. Thus, by the method I am about to describe, I have seen the temperature in hyperpyrexia reduced in two or three hours from 107° to 101°, or even lower.

Dip four napkins, or small towels, into iced water, and wring them nearly dry, so that they may not drip and wet the bed, then apply them one below the other from the chest downwards. As soon as the four cloths are disposed over the chest and abdomen, re-dip and re-wring the uppermost, then the second, third, and fourth, seriatim, then the first again, and so on continuously. Supplementary napkins to the head, thighs, and arms will of course still more quickly lower the temperature, and, indeed, should be employed to a big and stout patient, since large quantities of heat have to be withdrawn through the badly conducting fatty layer beneath the skin. If the napkins are very frequently changed, this method is most efficacious, and is often highly agreeable to the patient, being in this respect preferable to the, usually, very disagreeable general cold bath. In some instances, even after the discontinuance of the cold cloths, the temperature steadily falls for several hours.

The repetition of these processes must be regulated by the subsequent course of the fever. If in three or four hours the temperature again rises to 103°, Brand repeats the affusion. In most cases he finds that six affusions are enough, and afterwards he applies cold cloths wrung out of water at 60° Fah. two or three times a day; these applications, provided the temperature does not rise higher than 100° Fah., being made smaller and less frequent as the case progresses. In very severe cases the affusion must be employed every two hours. When the patient is comatose, and the foregoing treatment fails to restore consciousness, Brand applies a cold affusion of 45° Fah. to the head every half-hour.

Dr. Stöhr recommends the continuance of this treatment in typhoid fever to the middle of the third week; but it may be required longer, and here the thermometer decides.

Ziemssen and Immerman find that with their plan four or five baths are necessary the first day, and that subsequently two or three daily will suffice, the repetition, however, being regulated by the information afforded by the thermometer. They prescribe the bath at 6 A.M., and 1 to 3 P.M., and at 7 P.M. Ziemssen and Immerman found, as might be expected, that in typhoid the degree of cooling and its duration differed according to the patient's age, and the severity of the case. Thus they found the usual reduction to be 3·6° Fah. in children, and 2·5° Fah. in adults. In severe adult cases, however, the temperature fell only 1·8° Fah., and the effect of the bath was least evident in cases where the morning remission was slight. In severe infantile cases they found that the temperature recovered its former height in six hours, in adult cases of moderate severity in seven hours, in severe adult cases in six hours and a half, and in cases with slight morning remissions in three hours.

A single bath often effects a considerable reduction of the febrile temperature. Thus Mosler reduced the temperature in a case of typhoid 7° Fah., and the late Dr. Wilson Fox, in one of his interesting cases of rheumatic hyperpyrexia, 12·4° Fah.

Dr. Wilson Fox's exact and continuous observations on some cases of rheumatic hyperpyrexia add precision to our knowledge of the effects of cold baths. He has shown that the fall of temperature continues to the extent of even six or more degrees, for forty or fifty minutes after the discontinuance of the bath. It is important, therefore, to observe the temperature in the rectum while the patient is in the bath, and to remove him before the heat is too far reduced, lest too great a withdrawal lead to collapse. This, indeed, appears sometimes to occur, for we read of cases becoming cyanotic, although German observers aver that this is not important, and advise in such cases the application of warm bottles to the extremities. I am convinced, however, that it is important to avoid depression to this hazardous extent, as I have seen a child, suffering from scarlet fever, killed by an over-energetic employment of cold.

German observers show conclusively that this treatment greatly reduces the mortality of typhus and typhoid fever. Thus, Brand treated 170 cases of typhus, and Bartels thirty cases of typhoid, without a single death. The mortality of Hagenbach's typhus patients was five per cent., provided the cases were treated early; and Dr. Stöhr reduced the mortality of his patients from thirty to six per cent., and the results, he thinks, would have been still more favourable could he have treated some of his cases earlier. Liebermeister lessened his mortality from twenty-seven to eight per cent.[1]

Notwithstanding the enthusiastic laudation of the cold-bath treatment of fevers by German writers, this plan is, at present, not habitually employed in this country. But if there be reason to hesitate whether we should treat the acute specific fevers or inflammatory fever by this heroic method, there can be no question respecting its necessity in the treatment of hyperpyrexia. This most dangerous condition generally arises from rheumatic fever, and to it, no doubt, most of the fatal cases of rheumatism are attributable. It may occur, however, in the course of any fever; and may, indeed, seize a person in apparently perfect health. The first case of hyperpyrexia ever recorded occurred whilst I was resident officer at University College Hospital, and this was an instance of a sudden attack in a woman who had recovered from rheumatic fever, and was on the point of leaving the hospital apparently in fair health. On being called to her assistance, I was surprised at the pungent burning heat of her skin, and to my astonishment found her temperature to be 110°, and a little later 111°. She died in eight hours. This phenomenon, so startling then, when hyperpyrexia was unheard of, has been noticed since in hundreds of cases. Hyperpyrexia not uncommonly attacks children who just before have seemed to be in good health. I have often seen children in severe convulsions, and have found their rectal temperature 107° and 108° Fah. The hyperpyrexia in these cases may have been due to the onset of an acute specific fever or of an acute inflammation; but, as these children all died, it was impossible to ascertain the cause of the onset of the fatal hyperpyrexia. Ordinarily, no doubt, hyperpyrexia occurs in the course of a fever, and generally, perhaps, when the curve of the temperature runs at a very high level, but it by no means rarely comes on in rheumatic fever when the fever is moderate and the symptoms are mild. In a typical case of hyperpyrexia the temperature rises rapidly, reaching in the course of a few hours 110°, 112°, or even higher. This severe fever perturbs and depresses the functions. At first the patient is restless and delirious, the delirium being either slight or so decided that he has to be restrained. Sometimes before the advent of delirium the patient becomes blind. The delirium soon subsides, and the patient becomes quite unconscious; the pulse, at first full and bounding, now becomes exceedingly frequent and feeble; the respirations are much hurried; the skin is generally dry; but it may be drenched in sweat. Then the coma deepens, the breathing becomes more frequent and shallow, and in a few hours the patient dies. Not a single case of hyperpyrexia, as far as I know, recovered till Dr. Wilson Fox first treated his cases with the cold bath. Since then this treatment has been largely employed, and with a great measure of success; indeed, it is not an exaggeration to say that the majority of the cases thus treated have been saved. In my own practice, in a considerable number of cases, this treatment has generally proved successful, and it is a source of great gratification to me that by means of Dr. Fox's treatment I have certainly saved many lives. In hospital we mainly use the general cold bath, but in private practice the application of ice-cold cloths in the way previously described will, I believe, prove more convenient, pleasant, and safe. In a given case several cold baths are necessary as a rule, for after the reduction of the fever, and consequent removal of the symptoms, the temperature generally rises again. It is interesting to note the passing away of the deadly symptoms as the temperature falls. The patient wakes out of the coma, and gradually the mind becomes quite clear; concurrently the pulse falls and becomes stronger, and he passes quickly from most imminent peril, from the very shadow of death, to the condition previous to the onset of the hyperpyrexia. Though, as I have said, several cold baths are generally needed to completely subdue the hyperpyrexia, yet in three cases after the first reduction of the temperature the hyperpyrexia did not return, but the patients forthwith passed from a condition of urgent danger into convalescence, without manifesting a single unfavourable symptom.

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[1] Recent statistics place the mortality for this treatment of typhoid at about seven per cent., *i.e.* on the lowest estimation, at one half the mortality of typhoid treated by ordinary methods.

This treatment not only reduces the excessive heat of fever, but it allays the nervous symptoms, and limits the wasting; according to Brand it also prevents meteorism and bleeding, and lessens the diarrhœa of typhoid. On the other hand, Hagenbach and Jürgensen assert that this treatment fails to lessen the meteorism and diarrhœa of typhoid fever, and to reduce the size of the spleen and the dicrotism of the pulse. All observers agree that cold baths do not shorten the course of typhoid, typhus, and other acute specific fevers; but Brand asserts, while Hagenbach denies, that they shorten the stage of convalescence.

This treatment rarely, if ever, induces either bronchitis or pneumonia, and the co-existence of either with fever does not contra-indicate the use of cold baths. Liebermeister even says that hypostatic congestion or pneumonia affords not only no reason for suspending the baths, but that, indeed, under their use, hypostatic pneumonia sometimes disappears. And though I have several times seen all the signs of double pneumonia arise after the bath, for instance, dulness, tubular breathing, bronchophony, yet these patients have done well. Hæmorrhage (recent) and peritonitis are, however, regarded as contra-indicating baths.

Ludwig and Schröder find that this treatment of fevers greatly reduces the quantity of carbonic acid exhaled by the lungs and the solid constituents of the urine, and that it thus lessens the tissue changes: a very singular fact, since cold baths, in health, have the very opposite effect.[1] Dr. H. Fox observes that sometimes the rectal temperature rises a little directly the patient is placed in the bath; and Drs. Fiedler and Hartenstein point out that immediately after the bath the axillary is much lower than the rectal temperature, but that half an hour afterwards this discrepancy is reversed, the rectal temperature becoming from 1° to 2° Fah. lower than the axillary, and so continuing during three-quarters of an hour.

The labour involved in frequent bathing, and the fatigue to the patient which much handling and lifting must entail, these are the chief objections to the treatment, and in private, nay even in hospital, they tax severely the available resources. Here is room for much ingenuity, on the part of the doctor and nurses. The bath should be brought to the side, and raised if possible to the level, of the bed. Dr. Burr[2] describes an excellent portable bath in the shape of a macintosh sheet which may be slipped under the patient on his own bed, and by means of a cradle apparatus may be converted into a bath capable of holding 20 gallons if need be. The less the fatigue to the patient, the more effective the bath. As previously stated, frictions with the hand should be practised during the bath.

THE WARM BATH AND THE HOT BATH

The effects of heat on the body are, of course, for the most part, the opposite of cold. By surrounding the body with a temperature higher than its own the destruction of the tissues by oxidation is considerably diminished. Moreover, experiment has shown that increased heat impedes or destroys the electric currents in the nerves, whence it may be fairly assumed that when subjected to this influence they are less able to conduct impressions either to or from the brain. These two considerations may perhaps account for the enfeebling influence of heat on the body.

The general warm bath, if not too hot, is at first highly pleasurable, but if unduly indulged in, throbbing at the heart and in the large vessels soon comes on, with beating in the head, and a sense of oppression and anxiety. These sensations, however, when perspiration breaks out, diminish greatly or cease altogether; but if the bath is continued too long, the foregoing uncomfortable sensations return, accompanied by great prostration, even to the extent of fainting; the pulse becomes greatly accelerated and enfeebled, while the temperature of the body rises very considerably, and, if the heat of the bath is great, may even reach 104° Fah., that is, a severe fever height.

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[1] It will be noted, however, that the method of administration of the bath in health, and in fever, differs essentially—the object of the former being to effect a reaction, of the latter to avoid such. Accordingly, in fever the application of cold is prolonged till a distinct depressant effect is produced, till indeed any powers of reaction of the organism are overcome. That depression is so readily brought about depends upon the enfeebled state of the body in fever.

[2] Braithwaite's *Retrospect*, vol. cxii. 1895, p. 133; quoted from *Journal of American Medical Association*, June 8, 1895, p. 867.

Warm baths are employed in Bright's disease to increase the perspiration, so as to lessen the dropsy, and carry off from the blood any deleterious matters retained in it through the inaction of the kidneys.

We must here always bear in mind the purpose of the hot bath, for it is too much the practice to employ hot baths in Bright's disease before the occurrence either of dropsy or uræmia. But inasmuch as the baths weaken the patient considerably, they increase the anæmia and so actually favour dropsy. They should therefore only be employed when dropsy or uræmic symptoms are marked. In dropsy, no doubt, they are often very serviceable by removing a large quantity of water from the blood, and so lessening the hydræmia on which the dropsy depends; whilst of undoubted service, however, they induce much weakness, if often repeated. In my experience baths are greatly inferior for this purpose to the plan of making incisions over each external malleolus in the way described in the section on acupuncture. This treatment reduces the dropsy much more speedily, and far more certainly.

The hot bath is used in uræmia with the view of eliminating urea and perhaps other retention products through the skin. There can be little doubt that this treatment is serviceable in removing many of the cerebral manifestations of uræmia, but it is very questionable whether the baths so act by eliminating urea; for it is, at best, doubtful whether the uræmic symptoms depend on the retention of urea in the blood, and further, it is uncertain to what extent, if any, the bath can eliminate nitrogenous products through the skin. It is certain that in health very little, if any, urea escapes by the skin, though it is probable that in some cases of Bright's disease urea is actually separated in the perspiration. Bartels records cases where crystals of urea covered the face, and by their accumulation on the beard gave it a frosted appearance.

The general warm bath is of signal service either in the simple or inflammatory fever of children. If a child is not very weak, a bath night and morning, for a time varying from five to ten minutes, soothes and quiets, and often brings on refreshing sleep. In the febrile diseases of grown-up people it is generally difficult to employ the general warm bath, but, in its stead, sponging with hot water often induces perspiration, and calms at the same time the restlessness of the patient, thus favouring sleep. The same means will soothe the restlessness of convalescence and induce sleep.

In inflammatory affections warm or tepid baths are supposed to act by dilating the blood-vessels of the skin, and so withdrawing blood from the internal organs, including of course the inflamed organ; by thus lessening the amount of blood in any given part the bath diminishes inflammation. Further, by withdrawing blood from the brain, the warm bath favours sleep.

The warm bath mitigates or removes the pain of colic, renal, biliary, or otherwise. Whether its effects in relaxing spasm and so removing pain are induced through its soothing influence on the skin, or through the weakness caused by the bath, is difficult to say; the bath certainly seems to ease the pain before any noticeable weakness is produced. In skin diseases of various kinds the general warm bath is invaluable. In psoriasis, eczema, ichthyosis, urticaria, lichen, prurigo, and scabies it may generally be employed with benefit. It is especially useful in the acute state of eczema and psoriasis. In these cases rain or boiled water should be used; but if these are not available, the water should be made more soothing by the addition of small pieces of common washing soda, gelatin, bran, or potato-starch. These baths allay inflammation and itching. The body must be dabbed dry with soft towels. If there is much itching, flannel should not be worn, and scratching should be prohibited.

It has been recommended to keep a patient with severe burns immersed for days in the warm bath: this treatment is said to ease pain, diminish suppuration, promote the healing process, and to lessen the contraction of the cicatrix. Local burns, as of a limb, may, if very painful, be most successfully treated by the continuous local bath; and the addition of common salt, in the proportion of a small teaspoonful to the pint of water, by approximating the water of the bath to the salinity of the plasma, renders the bath more bland to the tissues.

As a means of obviating the various symptoms occurring at the change of life, Dr. Tilt recommends the general warm bath of 90° to 95° Fah. for an hour once a week, so as to promote free perspiration.

The hot sitz-bath is very useful in cystitis and dysmenorrhœa. It allays pain and the incessant desire to micturate and the straining. If the symptoms are urgent, it may be employed two or three times a day from twenty to thirty minutes in cystitis, and even longer in dysmenorrhœa.

The local warm bath is used for a variety of purposes. It is hardly necessary to refer to the common household practice of putting the feet into hot water just before going to bed, to induce general perspiration, and so relieve catarrh. The hot foot-bath, or the sitz-bath, is of great service when the menstrual flow is either deficient or absent. To this bath mustard may be added with advantage, but, as the late Dr. Graves insisted, this stimulating bath should be used only at the menstrual period. Employed nightly, or night and morning, for six days, commencing one or two days before the period begins, this mustard-bath is a very useful auxiliary to other treatment, and often succeeds in establishing menstruation. The sitz-bath is often effectual when, through exposure to cold, or from other circumstances, the menstrual flow has been suddenly stopped, to the patient's great annoyance and suffering. Immersion in water as hot as can be borne is said to be very useful for sprains in their earliest stage.

Dr. Druitt points out that sponging the body with very hot water will for some hours diminish the excessive perspiration of phthisis.

Hot water to the legs and feet sometimes removes headache, and according to Dr. Graves relieves distressing palpitation.

Sponging the face, temples, and neck with water, as hot as can be borne, often relieves the headache of influenza, catarrh, and other diseases.

The immersion of the feet in hot water with or without mustard will often arrest nose-bleeding. The vessels of the lower extremities, and, probably, by reflex action the vessels of the pelvic organs, become much dilated, and hence blood is withdrawn from the upper part of the body, and vascular pressure lessened. The hæmostatic action may be in part accounted for by this depletion of the bleeding area by withdrawal to distant parts, but that the shock of heat, exactly as the shock of cold, may reflexly influence the whole body, and possibly therefore the bleeding area, must be clearly borne in mind.

Hot brine-baths, such as those at Droitwich, are very useful in chronic rheumatism, rheumatoid arthritis, gout, and sciatica. A brine-bath can be made by adding from twenty to thirty pounds of common salt to thirty gallons of water at a temperature of 100° Fah. The patient should take one daily of from twenty minutes to half an hour's duration, gradually extending the time to an hour. This produces no depression like a plain hot-water bath. On the contrary, it exhilarates. When only one or two parts are affected or painful, as the ankle or wrist, I have found that the immersion of the parts in a saline bath gives much relief. Many chronic cases of sciatica are more effectually relieved by this bath than by any other treatment. The efficacy of the salt-bath is the more singular in that the salt is the active constituent, for hot baths will not replace the saline baths, yet since little or none of the salt is absorbed, this bath must act by a topical influence only on the skin.

HOT-AIR AND VAPOUR-BATHS

THE *hot-air bath* very generally succeeds in promoting free perspiration, but when it is difficult thus to establish a free flow of perspiration, the hot-air bath may be preceded by the general warm bath.

Vapour-baths are used for the same purpose, and are less depressing than the general warm bath. Vapour and hot-air baths produce much less elevation of the temperature of the body, a circumstance which probably explains their difference in the above respect. The reason why hot-air baths are so much less potent than water-baths, is because, for any given temperature, the amount of heat which the air-bath pours into the patient is incomparably less than in the case of the water-bath. In other words, the dose of heat is incomparably less. The relative densities or tenuities of the two substances, their specific heats and conducting powers, explain this difference in activity.

The usual hot-air bath, with the lamp or hot bricks, does not in most instances cause heat enough to induce copious sweating. Gas as a heating agent is more efficient, but it is difficult to manage unless with a special apparatus. The lamp-bath under a cape, if the patient is strong enough to sit up, often induces very free sweating. The copious perspiration thus induced is very efficacious in relieving uræmic symptoms, and this treatment is much more efficient and less depressing than hydragogue purgation.

SHOWER, DOUCHE, AND SPONGE-BATHS

The forcible impact of water upon the body, and the impression it makes on the nerves, or, to use the general expression, the shock it produces, is sometimes very great, sufficient maybe, even in the case of strong and healthy persons, to produce considerable depression and languor, lasting hours and occasionally days.

The *shower-bath* is a remedy not much used, patients ordinarily manifesting great repugnance to it. The sponge-bath, or the local douche, may usefully supply its place.

In the *sponge-bath* we have all the conditions of the common bath. Both are cleansing, bracing, and invigorating, and the action of each is identical in kind.

The sponge-bath is often employed, not merely for its tonic effects, but for the sake of the shock it causes to the nervous system.

In the treatment of laryngismus stridulus cold sponging is more successful than anything else. The practice of confining little children, thus affected, to a warm close room, and sousing them in warm baths several times a day, is positively injurious, and inevitably aggravates the severity and frequency of the crowing breathing. Cold sponging twice or thrice daily, according to the severity of the case, will scarcely ever fail to modify the disease, however severe the attack.

So prompt is the relief of cold sponging that a child subject to hourly attacks during the day, and to ceaseless attacks at night, is frequently instantaneously delivered from them. At all events a decided improvement always occurs, and the intervals between the attacks are much prolonged. It rarely happens that the strident crowing resists this treatment more than two or three days. The mother should be directed to keep the child out of doors the greater part of the day, no matter how cold the weather—indeed, the colder the better. Laryngismus seldom attacks children more than a year old. At so tender an age it might be feared that the child would run great danger of catching cold from the sponging treatment, but no such fears need be entertained. With the necessary precautions even the youngest child may be sponged with perfect safety several times a day. Nor will the average child catch cold even in the coldest weather when carried out of doors, though one prone to bronchitis should be kept indoors when the weather is very severe, and undergo the cold-water sponging only. After a very extensive experience of this treatment I have rarely found that children suffering from laryngismus catch cold, and in the exceptional cases the catarrhal symptoms have been insignificant. This treatment frequently saves life, and averts not only the crowing breathing, but also dangerous symptoms, such as partial convulsions in the form of carpo-pedal contractions and squinting; laryngismus, when fatal, generally destroys by exciting an attack of general convulsions. Laryngismus stridulus is sometimes accompanied, and is indeed at times apparently induced, by laryngitis, as indicated by the peculiar hoarse voice. In such cases cold sponging must be used cautiously, for it often, though by no means invariably, increases the laryngitis, and therefore the laryngismus. Among the poorer classes, at certain seasons of the year, laryngismus is one of the most common causes of convulsions, which tend so often to a fatal issue.

The surest and speediest way of arresting a paroxysm of crowing breathing is to dash cold water over the child. At the onset of a paroxysm cold water should be dashed on the child's face, and if this does not at once arrest the attack, water should be applied to the whole body. Laryngismus fortunately prevails in the early spring, when the cold weather itself is a ready means of cure.

Since by this treatment laryngismus is usually cured at once, or rarely lasts more than a few days, it is obvious that, in these cases, cold water does not act as a mere tonic, although in this respect also it is very useful, because laryngismus generally attacks weakly, sickly, and rickety children.

Any irritation aggravates laryngismus and impedes its cure. Hence, if the relief from cold sponging is less marked than might be expected, some source of irritation should be sought for and removed. The gums, if swollen, red and hot, must be freely lanced and the cuts maintained open, for if they close the irritation recurs;

it may thus be necessary to lance the gums every few days. Worms must be removed, and the faulty state of the mucous membrane favouring their production treated. At the cutting of each tooth laryngismus is apt to recur in spite of cold sponging, but the relapse is seldom severe. When the tension of the gums is relieved and the tooth set free, the attack ceases. Irregularities of the bowels, diarrhœa, constipation, flatulence, etc., tend to increase the frequency of crowing, and to render the case less amenable to cold sponging.

It may here be useful to advert to a condition not uncommon in infants. An infant in poor health frequently wakes up at night suffering from "a catch in the breath." For some unexplained reason it cannot, for a time, get its breath, and it wakes up with a loud snore. This condition is altogether different from that of laryngismus stridulus, and the fault appears to lie in the soft palate, not in the larynx; it is not due to enlarged tonsils, as this "catch in the breath" occurs in children of tender age, long before the morbid conditions of the tonsils take place. Cold sponging night and morning will improve or even cure this curious complaint.

Cold sponging several times a day holds also, deservedly, a very high place in the treatment of chorea. It is at present impossible to decide whether its efficacy is due solely to its tonic properties, or whether the shock plays any part in promoting the cure. Of the value of this treatment there is no question, yet circumspection must be exercised or the patient may be made worse. It must be avoided if there is any rheumatism, which is generally made worse by cold sponging, thereby inducing an increase of choreic movements. If there is no fever, and no pain in any of the joints, then cold sponging may be reasonably expected to yield most satisfactory results.

In the treatment of rickets, cold sponging, by virtue of its tonic properties, is held in high estimation. Here, again, care must be observed, or much harm may be done. We must remember that a rickety child is often not only very weak, but on account of its tender years very impressionable, and for these reasons it is important to adapt the application of the cold sponging to the patient's condition. If the child is old enough to stand, he should be placed up to the ankles in warm water before a good fire, and then, except the head and face, be sponged all over with cold water from two to five minutes. He should then be carefully wiped dry, and well rubbed with a soft towel. If weakly, the child may be replaced for a short time in a warm bed to encourage reaction. The sponging should be administered as soon as the child leaves his bed, but if very weakly or unaccustomed to sponging, it is advisable to give a light and early breakfast about an hour beforehand. There is another excellent method of administering cold sponging to weak persons or to timid children, and therefore a plan to be adopted when this agent is used in the treatment of chorea. The water, at first tepid, should be gradually reduced in temperature by drawing off the warm water and substituting cold. The shock is thus avoided, whilst the tonic virtues of the bath are still obtained. This latter method succeeds admirably with timid children, who, much frightened by the bathing, scream sometimes so violently as to lead their friends to fear an attack of convulsions.

Cold sponging is very invigorating for adults in impaired health; it is useful also in anæmia, leucorrhœa, amenorrhœa, spermatorrhœa, and in that low nervous state induced by working in hot, close, ill-ventilated rooms.

In cold weather the water should, at first, be made a little warm; afterwards the temperature should be daily lowered. By a little light food taken about an hour before the bath, and by a return to bed for half an hour after its completion, to restore warmth to the skin and extremities, we shall generally prevent depressing effects on weakly subjects.

Affusion and the Douche.—Cold water thus applied impinges on the body with considerable force, and the resulting nervous impression is correspondingly great. In the case of the Douche, water is directed against the body in a full stream, and is applied sometimes to every part of the surface in succession. The depression produced is too great to admit of its frequent employment. It is generally modified, and the cold affusion used in its place; in this, cold water is dashed in pailfuls over the surface of the body. Affusion is recommended in sunstroke when a patient is struck down and rendered unconscious. Many years ago cold affusion was employed in the treatment of the acute specific fevers, and it was especially recommended in scarlet fever; it was then regarded as a well-tried mode of treatment, sanctioned by the authority of many of the ablest physicians of the past generation. Yet in the present day the reaction against all energetic treatment is so great that this means is now very rarely adopted. Fears are expressed lest serious consequences should ensue; but if the affusion is employed at the right period, no apprehensions need be entertained, as the experience of Currie and Jackson abundantly testifies. It should be employed during the early days of the fever, when the skin is hot and the rash bright red.

Currie and Jackson recommended that the patient should be stripped, and that four or five gallons of very cold water should be dashed over him, a process to be repeated again and again when the heat of the surface returned. This treatment diminishes the fever, and sometimes, it is stated, even extinguishes it.

The douche and affusion are generally employed for their local effects. They are of the greatest service in rousing a patient from the stupor of drunkenness, or from that of opium poisoning, and when a certain stage of the poisoning has been reached no other treatment is so efficacious. Excessive tippling or an overdose of opium ind stupor more or less profound, in which the movements of respiration, at first languidly performed, soon stop, and death by asphyxia results. At this most critical stage cold affusion, or the cold douche, applied freely to the head, is generally sufficient to remove the conditions within the skull on which the stupor depends. Consciousness is restored, the breathing simultaneously becomes natural, and for a time, at least, the fear of a speedily fatal termination is set at rest. The water should be poured on the head from a good height, so as to secure as great a shock as possible. The vigour of the application must be regulated by the pulse and general state of the patient. Under this treatment the breathing becomes deeper and more frequent, the livid, bloated aspect of the face soon disappears, and the pulse grows in strength. It often happens that relapses occur, in which case the affusion must be again and again employed, so as to sustain life long enough to admit of the elimination of the poison. If promptly and efficiently applied, life may be saved even in the most unpromising cases. It is all-important to ply the water abundantly for some time, and from a good height. Some interval may elapse before any good effects become visible, but if the pulse and breathing improve, or become no worse than before the douche was tried, its application should be continued, and perseverance will often be rewarded by success.

Sayre, and more recently Broadbent, have drawn attention to the use of the cold douche to induce sleep in delirium tremens, and in the pyrexia after childbirth, and probably in febrile diseases generally. A large sponge soaked with cold water, iced if possible, is dashed against the head, face, and chest several times. The skin is then rubbed dry with a rough towel, and sleep follows in some instances almost immediately. If the sleep is too brief, repeat the application. In delirium tremens I have often seen similar good results follow the application of the general cold pack, and when the sleep was short I have repeated the pack hourly for several hours, each repetition inducing refreshing sleep.

Probably this treatment by dilating the cutaneous vessels withdraws blood from the brain and so produces sleep.

Many cases of furious maniacal delirium may be quieted by the cold douche. It must be borne in mind, however, that the douche is a powerful remedy, and that it is very necessary to watch carefully its effect on the patient's strength. To obviate excessive depression it is an excellent method to place the patient in a warm bath, and to apply cold to the head in the manner just described.

The severe pain in the head, met with in acute specific fevers, or resulting from gastric disturbance, may be relieved very gratefully and effectually in the way recommended by Dr. Hughes Bennett: "A washhand-basin should be placed under the ear, and the head allowed to fall over the vessel, by bending the neck over the edge; then a stream of cold water should be poured from an ewer gently over the forehead, and so directed that it may be collected in the basin. It should be continued as long as agreeable, and be repeated frequently. The hair, if long, should be allowed to fall into the cold water, and to draw it up by capillary attraction." The ice-bag may be conveniently substituted for this application, or Thornton's cap, composed of two rolls of india-rubber tubing, through which iced cold water is made to flow. This application greatly relieves headache and lessens or even prevents delirium and favours sleep. Dr. Hughes Bennett agrees with Graves, that in some cases very hot water acts even more efficiently than cold.

The cold douche is also an excellent local tonic to individual parts of the body. It may be employed to remove the stiffness in joints remaining after slight injuries, or resulting from rheumatism or gout; salt may advantageously be added to the water. The force of the douche's impact on the affected part, and the duration of its application, must be regulated by the condition of the tissues. If there be much local weakness, it is better at first to play the water in the neighbourhood of the injured or weakened joint. The douche is also useful in chronically inflamed and swollen joints. In the early stages, especially when tenderness persists, it is useful to immerse the part in hot water for twenty to thirty minutes, and immediately upon removing the joint to cold douche it either by means of a single stream or by a rose, this for one to two minutes, well rubbing the joint afterwards till it glows. Dr. Fuller recommends the cold douche to be played for one or two minutes upon joints affected with rheumatic arthritis; or the water may be slightly warmed in winter, and then the parts rubbed till they are warm and dry.

Much good may be effected in spermatorrhœa by the free application of cold water to the perinæum and buttocks several times a day, and by the suspension of the testicles in cold water for a few minutes night and morning. The same treatment is useful in varicocele. A cold-water injection of about half a pint every morning before going to stool relieves or, in many cases, cures piles, and it is always a useful addition to other treatment; injections of cold water are also highly recommended in chronic diarrhœa and chronic dysentery. The cold anal douche is very useful in pruritus ani as well as in piles. Many persons, especially women, are troubled with cold feet, particularly at night, so cold, indeed, as to effectually prevent sleep for hours. This condition, which may rank as a distinct ailment, is best treated by immersing the feet nightly for a few minutes in cold water, rubbing them, whilst in the foot-bath, diligently until they become warm and glowing, and then, after thorough drying, clothing them in thick overlarge woollen or "fleecy hosiery" socks.

A cold or tepid sitz-bath is a very useful application. At first it contracts the vessels of the cooled skin, also the intestinal vessels, and increases the blood in the upper part of the body, causing even a rise of temperature in the axilla. Subsequently, and especially if followed by vigorous friction with a rough towel, the constricted vessels become dilated, and the abdominal circulation is increased and tone is given to the abdominal organs, constipation is thus relieved and the bladder strengthened.

I have often used, with advantage, a sitz-bath of a temperature between 70° and 80° Fah., for overworked patients who return from business tired, restless, and irritable. They should take the bath for ten minutes, about half an hour to an hour before a late dinner. It removes restlessness and invigorates and favours sleep.

For the troubles occurring at the change of life, also in the case of women weakened by excessive menstruation, I often obtain considerable benefit by sponging the spine with equal parts of white vinegar and spirits of wine, night and morning, for five to ten minutes; or by sponging the spine first with water as hot as can be borne, and then, for a few seconds, with a sponge wrung out of cold water. The former application is the most successful. It invigorates and soothes irritable nerves and prevents the fidgets. The same applications often relieve "cold feet."

Insomnia in some of its milder forms is successfully treated by hot spinal sponging as above described, without any subsequent cold application. It should be done the last thing before going to bed. The gentle pouring of hot water down the spine may be substituted for the sponging. This soothing remedy is of easy application, the patient sitting on a board placed across a bath or tub; in cold weather the body, with the exception of the spine, should be warmly covered.

THE TURKISH BATH

This bracing and depurating bath combines many of the properties of the hot and cold bath. The body, first subjected to great heat, is made to perspire copiously. If the bath ended here, more or less weakness would ensue, but at this stage the free application of cold water stimulates and braces the body, and produces the tonic effects of the cold bath. At each stage of the process the Turkish bath cleanses the system: the perspiration, of the hot stage, and the increased oxydation, of the cold stage, carrying off or consuming effete and noxious substances in the blood.

The Turkish bath, like sea-air and sea-bathing, is a true tonic. By a tonic, I understand any means which will increase both the destruction and the construction of tissue, provided the constructive remains in excess of the destructive process: by promoting the nutrition of the muscular, nervous, and other systems, tonics increase the potential forces of the bodily organs; in other words, tonics increase the capacity for function. By increasing tissue change, tonics promote appetite and digestion. (*See* Cold.)

These baths, says Dr. Goolden, are useful in gout, rheumatism, sciatica, Bright's disease, eczema, and psoriasis; they benefit bronchitis, the cough of phthisis, the aching of muscles from unusual exertion, pains in the seat of old wounds, colds in the head, quinsies, and common winter coughs.

It is not amiss here to caution persons prone to colds that the habit of over-clothing increases this liability. This cold-catching tendency may be obviated by using a moderate amount of clothing, taking a cold sponge-bath every morning, and occasional wet-sheet packing, or the Turkish bath once or twice a week.

On catching cold, a patient, with lungs previously healthy, becomes troubled for some time with chronic catarrh, accompanied by considerable expectoration and some shortness and oppression of breathing. In such a case the Turkish bath generally affords prompt and great relief, checking the expectoration and easing the breathing. In bronchial asthma and emphysematous asthma, a course of Turkish baths, say one every second or third day, is very useful; this subdues chronic bronchitis and renders the patient less liable to catch cold. A large chamois leather waistcoat reaching low down on the body and arms, and worn over the flannel, affords great relief in bronchial asthma and emphysematous bronchitis. This jacket is extremely warm, and protects the chest against the vicissitudes of weather. It is a nasty practice to wear it next the skin.

At the commencement of a feverish cold, a Turkish bath will cut the attack short, remove the aching pains, and relieve or cure the hoarseness at once. The bath will still prove very useful for a cold of several days' standing, though its good effects are less striking. The Turkish bath will relieve or carry off the remains of a general severe cold, as hoarseness, cough with expectoration, and lassitude. Whilst in the hot chamber the voice generally becomes quite clear and natural, though the hoarseness may afterwards return in a slight degree, but it usually continues to improve, becoming natural in a day or two, a repetition of the bath aiding complete recovery. In more obstinate cases several baths may be required. Great improvement of the voice in the hot chamber may be taken as a proof that the bath will benefit, even though, after the bath, the hoarseness return to a great extent.

The Turkish bath is serviceable to persons who after dining out, not wisely but too well, suffer next day from *malaise* and slight indigestion. A course of Turkish baths is very beneficial to town-dwellers leading a sedentary life, who, especially if they live freely, are apt to become stout with soft and flabby tissues, and who are easily tired, suffer from lack of energy and some mental depression.

Under the influence of the bath their muscles become firmer, the fatness decreases, and they acquire more spirit and energy.

A course of Turkish baths is useful to patients whose health has broken down by residence in a tropical climate; who suffer from general debility, enfeeblement of mind, dull aching pains in the head, and broken sleep. The Turkish bath, even its daily use, has been recommended highly for convalescents from acute diseases, to promote assimilation, digestion, and appetite. Patients suffering from jaundice, acquired in a tropical climate, or from malaria, have often testified to the beneficial effects of Turkish baths, but it is necessary, as indeed it is with all persons in shattered health, to caution them against the too vigorous and unrestrained use of the bath. The patient should leave the hot chamber as soon as free perspiration occurs, and should not plunge into the cold bath, but take a douche with slightly tepid water, especially in cold weather.

Many dread the Turkish bath lest they should catch a cold, and one often hears complaints of a cold coming on after a bath. So far from tending to give cold, these baths, as we have said, obviate the tendency to catarrh, and fortify delicate persons against a cold-catching tendency. If ever the bath is answerable for a cold, it is almost always owing to the bather leaving the bath-house too soon, perhaps in inclement weather, whilst his skin is still perspiring freely, or the hair is soaking wet.

Again, it is not unusual to hear complaints that the bath has induced considerable depression, or even exhaustion, lasting perhaps several days; but here again the fault rests with the bather. The bath must be adapted to the strength of the patient, and it is always prudent to take the first bath circumspectly, the bather not staying too long in the hot chamber, and undergoing the bracing application only a few seconds, with water not very cold. It is difficult to point out the precise time a bather ought to remain in the hot chamber. If delicate, and it is his first bath, he should not enter a chamber hotter than 130° to 140° Fah., and should stay there only twenty minutes or half an hour, or less, should he feel faint or tired. The patient's sensations are the best guide; sometimes, especially if suffering from pain, the bath soothes and eases, and then he can remain in the hot chamber an hour the first bath; but, I repeat, he should at once leave when he feels faint or tired. Not seldom the patient, on commencing the bath, fails to perspire; in this case he should remove from the chamber after ten minutes, have warm water poured over him, and be well shampooed, and, unless he is tired and faint, he should then return to the hot chamber. It is a rule in these establishments to advise even an old bather not to enter the hotter chamber of 180° to 220° Fah. till the skin has become moist with perspiration, though many disregard this injunction with apparent impunity. Even if the first bath cause some depression, this need not happen afterwards, partly because the bather will have become accustomed to the process, and partly because he will know how to adapt it to his strength. Yet it must be admitted that some persons, even with every precaution, cannot take a Turkish bath without experiencing much depression.

Acute rheumatism and acute gout have been treated by these baths; but, as in most instances, the severity of the pain renders it impracticable to take patients thus affected to a Turkish bath, a modified substitute for it, shortly to be described, may be taken at home. The acute pain of gout, it is said, disappears in the hot chamber, to return soon afterwards in a diminished degree.

The Turkish bath is particularly valuable in subacute and chronic gout, but, as might be expected, it is not in all cases equally serviceable. In long-standing cases in which the attacks have occurred so frequently as to distort the joints by deposits, and in which the patients are, perhaps, liable to repeated relapses, and are scarcely ever free from pain, the efficacy of the bath, though striking, is less apparent than in milder and more tractable forms; yet even in these severe cases the bath affords considerable relief by diminishing the frequency and severity of the relapses, and by removing the pervading sense of invalidism. The Turkish bath is, perhaps, more efficacious than other remedies in a case of the following kind:—A patient, inclined to stoutness, complains of slight and fugitive pains; the joints, but little swollen, are merely stiff and a little red and hot; many parts, often in succession, are affected, *e.g.* the joints of the limbs, the head, the back, and perhaps some of the internal organs, as the bladder, etc.; during the attack the patient complains of *malaise*, and the complexion becomes dullish; the tissues are soft and flabby, and, in spite of judicious diet and abundant exercise, the patient is seldom free from some evidence of gout, sufficient to annoy, but not to disable; in such a case after one or two baths the pains, the swelling, and the *malaise* disappear, the joints become supple, and after a time, the baths being continued, the complexion loses its sallowness, the tissues become firm, and the undue stoutness diminishes. On discontinuing the baths the gouty symptoms will often recur, again to disappear on the resumption of the treatment. A gouty patient may advantageously supplement the action of the Turkish bath by drinking certain suitable natural mineral waters.

The Turkish bath is useful in the various kinds of chronic rheumatism.

A patient who, in damp weather, or during an east or north-east wind, suffers from stiffness and pains in several joints, will derive much benefit from the Turkish bath. In a case of this kind the shoulder joint is often the one affected, the pain and tenderness being frequently limited to a small spot.

Again, a patient without any previous history of rheumatism finds his shoulder set fast, he is unable to move it—or only to a limited extent—without great pain. Here, also, the pain and tenderness may be very circumscribed. In such a case a Turkish bath generally affords great relief. Galvanism, also, even one application, will often entirely remove or greatly lessen the pain and stiffness. Again, the Turkish bath gives much relief in mild and chronic rheumatoid arthritis, and often retards the march of this disease. The bath often relieves lumbago.

Mr. Milton finds the bath useful in allaying the tormenting itching of prurigo unconnected with lice.

Should it happen that the regular Turkish bath is not available, then one or other of the following modifications of it may be substituted:—The patient, quite naked, seated on a wicker chair, with the feet on a low stool, is enveloped in two or three blankets, the head alone being exposed; a spirit lamp with a large wick is then placed under the chair and is lighted. In about a quarter of an hour perspiration begins to stream down the body; this secretion may be increased by drinking plentifully of water, and also by placing a pan of water over the lamp. When the patient has perspired sufficiently, the blankets are quickly removed, and one or two pailfuls of cold water are poured over the body; if this affusion is too heroic, the patient may step into a general bath at 80°, or, better still, at a temperature a few degrees lower. Dr. Taylor, of Nottingham, finds this treatment useful in obstinate skin affections, rheumatism, catarrh, syphilis, and in obesity arising from an inactive life. The instrument-makers now supply convenient forms of the domestic Turkish bath. It is far better, however, when practicable, to employ the Turkish bath itself.

Dr. Nevin recommends highly the following handy steam-bath in the treatment of acute rheumatism, when the patient is lying helpless and immovable in bed:—A couple of common red bricks are placed in an oven, hot enough for baking bread; in half an hour, or a little more, they will be sufficiently heated for the purpose. The patient's body linen having been previously removed, these two bricks are folded, each in a piece of common thick flannel, thoroughly soaked in vinegar, and laid on two plates; one is then placed about a foot distant from one shoulder, and the other about equally distant from the opposite leg, and the bed-clothes are then made to cover in the bricks and are tucked closely round the neck of the patient. A most refreshing acid steam-bath is thus obtained; and the supply of steam may be kept up, if necessary, by removing one brick and replacing it by another hot one kept in reserve. When the patient has been in the bath for fifteen or twenty minutes, the bed-clothes and plates should be removed, and *the patient instantly mopped all over, very rapidly, with a towel wrung out of cold water*, and then quickly rubbed dry. Dry warm linen must be put on at once, and dry bed-clothes must replace those which were on the bed previously. The under sheet can be removed, and a dry one substituted by fastening the corners of the dry sheet to those of the damp one; generally very little difficulty is met with in simply drawing the old sheet from under the patient, the dry one following it, and being left in its place. The patient is wont to experience great and speedy relief from this bath. The exhausting sweats are usually diminished, and the necessity for opium much lessened. The change of the body linen can be easily accomplished by tearing the night shirt open from top to bottom down the back. The steam-bath and subsequent cold douche should be continued after the patient is able to walk about, as they contribute to the healthy action of the skin and promote free mobility of the joints. After the patient is able to get out of bed, the bath may be administered in the manner previously described. The steam-bath, according to Sir E. Sieveking, relieves the pain and checks the perspiration in acute rheumatism to a degree he has failed to attain by any other treatment.

The following method may also be used as in some degree a substitute for the Turkish bath. After a general hot bath, sponge all over with tepid or cold water; or sponge the whole body first with hot water and then for a short time with cold water.

Some persons who cannot stand the usual morning cold tub can substitute these methods with much benefit, and obtain thus the very same tonic invigorating effects.

THE NAUHEIM-SCHOTT TREATMENT OF CARDIAC FAILURE

It will be readily admitted that in the treatment of heart affections an essential is to maintain the nutrition of the heart muscle at its highest. All those influences which tend to improve nutrition, generally, act beneficially upon the heart by virtue of the improved metabolism which results, provided always that they are not paid for too dearly by increased strain upon the vascular system.

In the Nauheim-Schott treatment several factors are present:—(1) The place itself has a climatic value which, in addition to change of scene, produces a general mild tonic effect; (2) the bath waters by their saline and gaseous constituents are distinctly stimulating to the system: these waters have a naturaltem perature range of 80°-95° Fah.; (3) the bath treatment is generally supplemented by massage and the use of what are termed "resisted movements," which judiciously administered are valuable to the nutrition generally and directly promote a better circulation.

There is probably nothing mysterious in the good effects of a carefully supervised course at Nauheim in suitable cases, if we are content with gradual improvements in pulse rate and pulse filling, and do not demand sudden shrinkages in heart volume, and sensational cardiac diagrams. "Further it should be stated that none of the methods in use there (at Nauheim) are regarded as incompatible with the contemporaneous use of cardiac tonics, such as digitalis and strophanthus, or with other remedies used ***secundum artem***."[1]

To begin with, the baths are administered at the temperatures 92°-95°, freed somewhat from their excess of carbonic acid; duration of bath, 6-8-10 min.

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[1] Report of Lancet Commissioners. *Lancet*, Aug. 29th, 1896, p. 620.

bsequently the baths are increased in strength of salinity, by additions of ther-lye (obtained by evaporation), and they are used in full carbonic acid ength: they thus become more stimulating. At the same time the tem-rature of the bath is lowered to 85°-82°, and its duration is increased to -20 minutes or even longer. To begin with, the baths are taken not more en than every other day, and throughout the course there are frequent in-rruptions of one or more days. Finally, in suitable cases the "Strom," or am, bath is employed, the patient lying in a current of the strong gaseous ine: this is the most stimulating of all, and therefore needs most care in the escribing.

Throughout, the patient should rest *at least* one hour after the bath, and e subsequent resting must depend upon the vitality of the patient and the y in which the bath is reacted to.

The course lasts some six weeks, and should be followed by a stay at some itable health resort, where without the fatigue of routine bathing and exer-sing, the patient recruits simply.[1] To this end patients are sent from uheim to the higher parts of the Taunus, to the Black Forest, and to itzerland. The baths may be supplemented by massage alone, or by assage and the movements.

The Nauheim treatment is carried out at several places in this country, *e.g.* Llangammarch in Brecknockshire, at Buxton, Harrogate, Sidmouth, and her places. That it may not fall into discredit, it is essential to carefully lect the cases, and carefully supervise them. There is no reason why the ethod of baths and massage should not be applied at the patient's own me.

The treatment is adapted for the more vigorous cases of heart failure, but ovided that we temper it according to the condition of the patients, it may d its place *more or less* in most cases; absolute rest, however, as an initial eatment is not likely to lose its place in cardio-therapeutics. To finish up e Nauheim-Schott treatment the patient may be set to climb gradients cording to the method of Oertel.

Baths are artificially prepared in imitation of the Nauheim waters according the following formulas of Mr. Armstrong, of Buxton:—

No. 1 bath contains 4 lb. of common salt and 6 oz. of chloride of calcium;
" 2 " " 5 lb. " " 8 oz. " "
" 3 " " 6 lb. " " 10 oz. " " with
e addition of 6 oz. of bicarbonate of soda and 7 oz. of hydrochloric acid.

No. 4 bath contains 7 lb. of common salt and 10 oz. of chloride of calcium ith the addition of 6 oz. sodium bicarbonate and 12 oz. of hydrochloric acid.

No. 5 bath contains 9 lb. of common salt and 11 oz. of chloride of calcium ith 1 lb. sodium bicarbonate and 1½ lb. of hydrochloric acid.

No. 6 bath contains 11 lb. of common salt and 12 oz. of chloride of calcium ith 1½ lb. of bicarbonate of soda and 2¼ lb. of hydrochloric acid.

Each bath consists of 40 gallons.

Dr. Bezley Thorne, a strong advocate of the system, recommends the use of ndow's effervescent salts in the place of the bicarbonate of soda and the id.

Dr. Saundby's experience is of the first four baths only.[2]

According to Sir T. Grainger Stewart the prime factor which stimulates in ese baths is the nascent carbonic acid.[3]

The temperature of these baths would begin, with the milder ones at 95°-92° d be gradually reduced for the stronger baths to 85°-82°.

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[1] *Lancet*, Aug. 29th, 1896, p. 621. [2] *British Medical Journal*, Nov. 2nd, 1895.
[3] *Lancet*, Aug. 8th, p. 387.

POULTICES AND FOMENTATIONS

Poultices and fomentations which are in such common use are simply local baths applied to the skin. When its surface or the structures beneath it are inflamed, poultices and fomentations are a convenient and efficacious means of utilizing warmth and moisture in the treatment of diseased parts. The warmth and moisture relax the vessels, and increase the collateral circulation, and in some degree abate the tension due to inflammation, and so relieve pain. Applied at the very beginning to inflamed tissues, threatening abscess, inflamed pimples, and the like, poultices often check summarily the inflammation, and prevent the formation of pus. Fomentations with water as hot as can be endured also arrest inflammation and check the formation of matter, and should be generally employed as adjuncts to poultices. Hot fomentations will often disperse or restrict the development of acne indurata, herpes labialis, and other inflamed pimples apt to appear on the face.

These applications are of further use when suppuration has set in and matter requires to be expelled. Poultices, then, greatly facilitate the passage of the matter to the surface and assist its expulsion, while, at the same time, they limit considerably the spread of inflammation in all directions. Here, again, very hot fomentations, often repeated, and continued for some time, are a useful supplement to poultices.

It should be remembered that much depends upon the heat of the application. Poultices should be always applied as hot as they can be borne, and should be frequently changed, lest they become cold and hard. Indeed, they can scarcely be changed too often; in hospital practice it is difficult to renew poultices constantly; yet even in such institutions, where the supply of nurses is limited, poultices should be changed at least every two or three hours.

When applied to disperse inflammation, or to hasten the maturation of abscesses, the poultices should be large, reaching beyond the limits of the inflamed tissues; but as soon as the abscess or boil has matured and burst, the poultice should be very little larger than the opening in the skin through which the matter escapes. A large poultice, applied over-long, makes sodden and irritates the skin, and is very liable to produce an eruption of eczema, or to develop fresh boils around the base of the original one.

Open sores, such as discharging abscesses, or sloughing sores or ulcers, are best treated with lint soaked in a saturated solution of boracic acid, or some other antiseptic agent, in order to destroy germs, and so prevent suppuration and further destruction of tissue. The boracic application is useful in the acute stage of eczema. We may here add that the antiseptic method may be combined, if necessary, with poultice treatment by smearing the surface of the skin, or other part, with a suitable antiseptic, *e.g.* the glycerine of boric acid, before applying the poultice.

In the treatment of boils, carbuncles, abscesses, and inflamed lymphatics, it is an excellent plan to smear over the inflamed tissues a compound of equal parts of extract of belladonna and glycerine, and over this dressing to apply a poultice. The belladonna eases pain and reduces inflammation. (*See* Sulphides.)

In order to protect the adjacent tissues from the undue action of the poultice, so as to check the production of fresh boils, it is a good plan to place over the boil a piece of opium plaster with a circular hole, and to apply the poultice only over the plaster. Another protective plan is to smear the contiguous surface with zinc ointment.

Poultices moderate the inflammation and alleviate the pain in skin diseases, such as eczema, etc., when the skin is highly inflamed, painful, red, and swollen.

Poultices are not only soothing when in direct contact with inflamed tissues, but they appear to act in the same manner on *deep-seated parts.* Large poultices applied very hot, and removed as soon as they become cool, are hence of great service in pneumonia, pleurisy, bronchitis, pericarditis, peritonitis, etc. To avoid exposure of the warm moist skin, the old poultice should not be removed till the new one is ready to replace it.

These applications are extremely useful for children attacked with bronchitis, broncho-pneumonia, or lobular pneumonia. As young children are apt to be restless, and to toss about in bed, the entire chest should be enveloped in a jacket-poultice. The ordinary poultice soon becomes rucked up, and converted into a narrow band encircling only a very limited portion of the chest, whilst the uncovered part of the chest is exposed to cold. The jacket-poultice should be constructed of a piece of linen sufficiently large to go quite round the chest, and tapes should be sewn to it in such a manner that they can be tied in front, and over each shoulder. It is as well to have three pairs of tapes, so as to admit of three fastenings down the front of the chest.

A poultice, to retain its heat, should be spread an inch or more thick, or it may be made thinner, and externally coated with a layer of cotton-wool. The cotton-wool being light, does not hamper the breathing—a matter of importance especially in the case of children. In peritonitis it is of great importance to spread the poultice thin and cover it with a layer of cotton-wool, for if heavy it aggravates the pain.

Poultices are useful in acute rheumatism, lumbago, sciatica, pleurodynia, myalgia, and in those so-called rheumatic pains which often attack limited parts of the body, as one arm, etc.[1] They are soothing and pleasant to the inflamed joints in rheumatic fever, although cotton-wool is often preferred, and, indeed, possesses the great advantage of involving much less disturbance of the joints. In acute lumbago, poulticing often brings speedy relief, the severest cases being greatly benefited in a few hours, and generally cured in one or two days. The poultice must be very hot, and large enough to cover the whole of the loins or part affected, and it must be thick enough to remain quite hot for half an hour, when it must be changed. If the pain is persistent this treatment should be continued for three hours, or longer; the skin must then be covered with a piece of flannel, and the flannel covered with oil-silk; this after-treatment promotes, what is most desirable, free perspiration.

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[1] Galvanism is highly useful in some forms of these complaints, especially in lumbago. In sciatica it gives at least temporary relief, and in some cases

When electricity, the needle, *i.e.* acupuncture, or poultices fail to give more than slight temporary relief, it will often be found that the lumbago is accompanied by high fever, and is the first symptom of an attack of rheumatic fever.

Sciatica may be treated in the same way, but the result is not often so satisfactory. (*Vide* Ether.)

Poultices applied in the same way as for lumbago, and followed by the application of lint and oilskin, are often useful in severe forms of pleurodynia and myalgia. Belladonna liniment, however, is usually sufficient, and is even to be preferred in pleurodynia; sometimes ether spray at once and permanently removes the pain of this annoying affection.

As we have said, poultices may be made of various substances—linseed-meal, oatmeal, bread, or starch. Each has its peculiar character. Linseed-meal and oatmeal poultices have most properties in common; they make a compact and only slightly porous mass, retaining heat and moisture longer than other kinds, and they are consequently often to be preferred to bread or starch. But linseed contains an acrid matter, which sometimes irritates, especially if the skin is of a fine and delicate texture, or if it is inflamed by some eruption, in which case oatmeal or bread must be substituted. Bread poultices are more porous and bland than those of linseed-meal, but the porosity depends very greatly on the way of making them. Bread poultices cool more quickly, and give less moisture to the skin, than those made of linseed-meal. Starch poultices retain their heat for a considerable time, and are very bland, unirritating applications.

It is as well to mention that linseed-meal poultices are more tenacious than those made of bread, and are therefore less liable to break up and fall about the bed and clothes of the patient, rendering him uncomfortable.

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a few applications will even effect a cure. Sciatica and deep-seated pains about the shafts of the long bones, even the dull aching pain in the joints, which not unfrequently remains after an attack of acute rheumatism, will often yield to galvanism.

In making a poultice, care should be taken that the water boils, and that all the materials, linseed-meal,[1] linen, strapping, bandages, or tapes, wool and oil-silk, are close at hand ready for use, and placed before a good fire to be thoroughly warmed. To prepare a linseed poultice sufficient boiling water should be poured into a heated bowl, and the meal then quickly sprinkled into the bowl with one hand, while with the other the mixture is constantly stirred with a knife or spatula, till sufficient meal has been added to make a thin and smooth dough. All this should be done as rapidly as possible, otherwise the poultice when made will be almost cold. Only an experienced hand can make a model poultice. By adding the meal to the water, with constant stirring, instead of the water to the meal, a thorough blending of the two ingredients is ensured, not a knotty, lumpy, uncomfortable mass, vexing instead of soothing the patient. The dough must then be spread quickly and evenly on the warm linen, already cut of proper size and shape, and the edges of the linen turned a little way over the meal to prevent any portion escaping beyond the linen, and also to protect the patient's clothes.

There are two methods of making bread poultices. One way is to cut the bread in thickish slices, put it into a basin, pour boiling water over it, and place the soaking mass by the fire for five minutes; then to pour off the water, add fresh boiling water, and again place by the fire; afterwards to drain the bread, beat up with a fork, and spread the poultice. The other plan is to cut stale bread into thick slices, put into a saucepan and cover with boiling water; allow this to simmer for a short time, then strain and prepare the poultice. The first plan makes a porous poultice, the second a more compact poultice, sharing the character of the linseed-meal mass. As we shall see, each poultice has its fitting application. The bread poultice may be made with milk or milk and water.

Bran poultices are useful on account of their lightness. They are conveniently made by enclosing the bran in a flannel bag of the required size, and then by pouring boiling water upon it.

Starch poultices are entirely unirritating, and retain their heat for a considerable time. The way to proceed is to add a little cold water to the starch, and rub the two into a pap; then to add sufficient boiling water to make a poultice of the required consistence, which must be spread on linen in the manner already described. Starch poultices soothe open cancers, and allay skin eruptions, when there is much inflammation, heat, and pain. According to Shoemaker they are the most soothing of all applications in skin affections.

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[1] There is some difference of opinion as to the employment of meal from which the oil has been expressed, or the pure unpressed meal derived from the crushed seeds. Mr. Beck advised the use of the former because the oil of the pure meal becomes rapidly rancid. A small quantity of warm olive oil stirred into the poultice at the end will add an emollient quality to this poultice.

Charcoal Poultices.—There are several ways of employing charcoal as a poultice. It is used to prevent disagreeable odours from foul sores, and it is thought also to promote a healthy condition of the tissues. When employed for this double purpose, charcoal is added to the poultice. As a porous poultice is here required, bread is better for the purpose than linseed-meal. A portion of the charcoal should be uniformly mixed with the bread, but the greater part should be sprinkled over the surface of the poultice. It is doubtful whether a charcoal poultice is greatly superior to a simple bread poultice, for the charcoal must soon cease to absorb gases, and thus lose its deodorizing property. It may, perhaps, promote a healthier condition in the sore. If the object is merely to prevent disagreeable smells and to keep the air of the room pure, the plan pointed out in the section on charcoal is to be preferred.

It is a good practice to sprinkle foul, sloughing, putrid sores with dry charcoal, and over the charcoal to place a simple poultice, or to make the poultice of well-toasted or of burnt bread. This treatment appears to hasten the separation of the sloughs, and to promote a healthier state of the tissues, and may be applied to a boil when the core is separating, or to a bed-sore while the black slough still adheres to the living tissues.

Yeast Poultices.—Some maintain that a yeast poultice is useful in sloughing sores, and that it prevents destruction of the tissues, and promotes the separation of sloughs. Yeast poultices are made in two ways. Yeast and water may be added to flour till ordinary dough is made, and the dough applied while fermentation is going on. In this case it is simply an application of "rising dough." The other way is to smear warm yeast over the surface of a simple bread poultice.[1]

Carrot Poultice.—This is supposed to make wounds cleaner and healthier; it is made by boiling carrots till they become quite soft, mashing them with a fork, and spreading the pulp on linen in the ordinary way.

To sloughing sores, as we have seen, it is best to apply some efficient antiseptic. The sores should be washed with saturated boracic acid solution, or with carbolic acid solution, etc., and then covered with lint or cotton-wool soaked in one or other of these solutions.

Laudanum is sometimes added to poultices to ease pain; it is especially effectual when the skin is broken. In like manner the official juices of hemlock or henbane may be smeared on the surface to be poulticed, or on the poultice itself. The unguentum conii might be used in preference to the extract of conium; the glycerine of belladonna is another excellent preparation for similar use.

Solutions of chloride of lime or of soda may be added to poultices to destroy offensive gases given off from unhealthy sores. The liquor sodæ or calcis chlorinatæ may be substituted for one-half or one-third of the water in the making of the poultice. (*See* B.P. proportions, linseed poultice.)

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[1] We must caution against the use of boiling or very hot water in preparing this poultice, lest the yeast be killed.

In eczema with much inflammation and sensation of heat, Dr. McCall Anderson recommends a cold potato poultice sprinkled with a small quantity of absorbent powder, containing camphor. This powder, a useful dusting powder without the poultice, is composed of half a drachm of camphor (reduced to powder, with the aid of rectified spirit), and three drachms each of powdered talc and oxide of zinc.

Professor Marshall employs an iodide of starch poultice to clean sloughing sores. A jelly is made with two ounces of starch mixed with six ounces of boiling water, to which before it cools should be added half an ounce of liquor iodi. The mixture is spread on lint, and applied cold.

Fomentations by means of several thicknesses of flannel wrung out of boiling water may be employed instead of poultices and for similar purposes. They are used for the sake of their moisture, and their warmth; they differ from poultices in being less weighty, and therefore less likely to increase the pain of very tender parts. The flannel is wrung out by means of a wringer made of stout towelling attached to two rods. The boiling wet flannel is placed in the wringer, which is then twisted round the flannel very strongly, till the water is thoroughly squeezed out. The wringer is useful, as the flannel when first taken from the boiling water is too hot to be held in the hands. In the absence of a wringer an ordinary towel will answer fairly well. Wrung as dry as possible, these fomentations may be used very hot without fear of scalding or blistering the skin. The fomentation should be covered outside with a piece of macintosh, and tied on with bandages. As hot fomentations cool quickly, and are chiefly used for the sake of their heat, they must be frequently renewed: when finally removed, the skin must be carefully wiped dry, and covered with flannel or cotton-wool to prevent chill.

Fomentations, and in a less degree poultices, relax spasm in the internal organs, as in intestinal, renal and biliary colic. In very extensive inflammation fomentations are preferable, since a large poultice is heavy and uncomfortable. Thus fomentations are employed when a limb is extensively affected with erysipelas, or when the tissues have been widely contused and have become inflamed.[1]

Sponging the face with water as hot as can be borne is a very useful application in acne indurata; it will disperse the incipient spots, and limit the size and hasten the maturation of the more advanced ones, and at the same time it will for some hours greatly lessen the redness of the eruption.

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[1] Fomentations, like poultices, may be medicated, thus we may have boracic or other antiseptic fomentations. The boracic fomentation is a most excellent application. Similarly we may use anodynes with fomentations.

Twenty or thirty drops of turpentine sprinkled on a hot fomentation makes a good counter-irritant, useful when it is needful to combine stimulation with a warm, soothing action.

An alkaline poultice, composed of nine parts of linseed-meal and one part of bicarbonate of soda, is a useful application in gout.

Sometimes it is desirable to apply heat to a part of the surface of the body, when at the same time it is important to avoid the relaxation of the tissues which moisture would produce. In such cases various dry, strongly heated applications are used. Flannel, almost scorched before the fire, or in an oven, is sometimes employed, but it loses heat speedily. Sand or chamomile flowers retain heat far better; they may be strongly heated over the fire in an iron pan, and then be run into a heated linen bag made for the purpose, of such shape and construction that the contents shall form a thickish and even layer. Each substance possesses its respective advantages: sand, though heavy, retains heat; chamomile flowers, though light, soon lose their warmth. A thin piece of flat tile heated in the oven, and wrapped in flannel, is lighter than sand, retains its heat for a considerable time, and is easily procured. These applications are of great service in relieving the pain of spasms.

Hot sand may also be conveniently used as a douche to chronically inflamed and painful parts; the sand may be poured on in thin or full stream.

THE MEDICINAL USES OF ICE

ICE is frequently used to abstract heat, to check bleeding, to allay inflammation, and to destroy sensation. Ice broken up with the help of a large needle into fragments may be enclosed in a bladder or thin india-rubber bag, first squeezing the air out of the bag. After filling the bag about one-third of its capacity, its mouth should be tied on a cork, so as to afford a hold for the twine. The ice-bag may then be adapted to almost any shape, and fitted to the inequalities of the body, and, if required, may be fashioned into a sort of cap for the head.

This cap is applied to the head in tubercular and simple meningitis, and may be employed to allay the severe headache of the early stages of acute fevers. Some apply ice to the head in delirium tremens and in the convulsions of children.

Sometimes the ice-bag laid on the epigastrium will ease the severe pain and vomiting of chronic ulcer, or of cancer of the stomach.

In typhlitis and typhoid fever an ice poultice applied over the right side of the lower part of the abdomen is often useful in relieving inflammation and pain.

A lump of ice inserted into the uterus, or pushed into the rectum, is sometimes used to arrest uterine hæmorrhage after delivery.

Ice is used internally for a variety of purposes. Sucking ice allays thirst, and is very grateful to fever patients; it will likewise check bleeding from the mouth or throat, stomach or lungs. To check bleeding from the stomach small pieces should be swallowed.

The constant sucking of ice is most efficacious in combating acute inflammation of the tonsils or throat; it is also very beneficial in the sore-throat of scarlet fever, and other acute specific throat diseases, and even in diphtheria. Used thus it often proves most soothing, allaying the heat and pain, and checking the abundant secretion of mucus, which is so harassing on account of the constant hawking and deglutition which it occasions. In tonsilitis, and indeed in all inflammations of the throat, the good effects of ice, especially when used at the very beginning of the attack, are most marked. The ice should be sucked as constantly as possible, and be continued till the disease has fairly declined.

In the same way ice is employed to allay the nausea, sickness, and pain of disease of the stomach.

An ice poultice, *i.e.* finely broken ice in a thin india-rubber bag, is a useful application to the throat in tonsilitis, scarlet fever, and diphtheria, especially when the lymphatic glands become greatly swollen and threaten to suppurate. I have seen swelling of the glands behind the angle of the jaw—so great that swallowing was well-nigh impossible—become so much reduced after a few hours' application of an ice poultice that the child was able to take food easily.

Ice may be applied to an inflamed and prolapsed rectum or uterus, to reduce inflammation and swelling, so as to enable these parts to be returned to their proper place.

The application of a small bladder or india-rubber bag of ice will dull or even neutralize the pain of inflamed piles, or that which is present after an operation for piles or fissure of the anus.

The ice-bag may be applied in prurigo vulvæ, but other treatment is generally preferred.

M. Diday strongly recommends the local application of ice in certain painful affections of the testis, such as neuralgia and blennorrhagic orchitis. Two pigs' bladders partially filled with ice are applied one under the other over the testis, the neighbouring parts being protected with napkins. The pain in orchitis is at first rather increased, but soon declines, and in a few minutes altogether ceases. In many cases the continuous application of ice-bladders for twenty-four to forty-eight hours removes the pain permanently. If on pressure any tenderness remains, the pain will return, and the ice must be continued three, or four, or even, five days, according to circumstances. On discontinuing the ice, wet cold cloths should be used, to permit the tissues to return gradually to their normal temperature.

Two parts of finely pounded ice with one part of common salt duce cold sufficient to freeze the tissues, and to deprive them of sensibility. This mixture, used largely by Dr. Arnott, is confined in a gauze-bag, and placed in contact with the skin till sensation is abolished, and the skin has a leathery feel, and assumes a shrunken tallowy appearance. If applied too long, this mixture may vesicate, but this will not occur under five or six minutes. This application is employed to prevent the pain of minor operations, such as extraction of the toe-nail and the opening of abscesses. Dr. Arnott recommends it in chronic rheumatism, in erysipelas, lumbago, and in the treatment of wounds. In chronic rheumatism it should be applied to the diseased joints for six minutes; it should then be replaced for a short time by pounded ice, to prevent the occurrence of inflammation from too rapid a return of heat to the tissues. An attack of lumbago may often be cured by freezing the skin over the painful part. Dr. Arnott asserts that when applied to wounds this mixture prevents inflammation without hindering union by the first intention.

In the performance of paracentesis thoracis a convenient way of applying ice and salt is, as recommended by Douglas Powell, to dip a piece of ice "with smooth surface, an inch or two square, directly into the salt, and apply it with firm pressure to the spot marked for puncture. In twenty or thirty seconds the spot will be frozen."

When applied for some hours Dr. Arnott's mixture destroys sensibility to such a degree that chloride of zinc paste may be used, in quantity sufficient, to destroy the tissues to a considerable depth, without inducing pain or inflammation. But ether spray, so conveniently and rapidly used in the manner introduced by Richardson, is now generally preferred for the purpose of freezing the tissues. Chloride of methyl spray, obtained from the condensed gas, and applied by means of a suitable instrument, is more certain in its freezing action than ether spray.[1]

In the treatment of distant hæmorrhage, *e.g.* hæmoptysis (by the local application of cold), iced compresses, or compresses containing Arnott's mixture between the folds, may be applied to the chest.

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[1] A single application of ether spray will often remove lumbago and sometimes sciatica. The spray is also useful at times in those frontal headaches commonly called nervous, which arise from either mental or bodily fatigue. Frontal headache, dull and uniform in character, lasting many days, occurring not uncommonly after excitement or an acute illness, such as erysipelas, a severe cold, or a sore throat, often succumbs to ether spray, but to get this result it is generally requisite to freeze the skin of the forehead.

The pain and stiffness of the muscles of the back in lumbago may often be instantaneously removed by running a needle an inch or more into the painful part; when the lumbago is double, this almost painless operation should be performed on both sides of the loins. Inserted along the course of the sciatic nerve, the needle sometimes affords instant and marked relief, even in very chronic cases of sciatica. This treatment, indeed, cures sometimes, as if by magic, severe and long-standing cases. The passage of an interrupted galvanic current will often speedily relieve lumbago.

Cold thus applied gives a rapid or an immediate reflex effect, but it is more than doubtful whether any advantage is to be gained by its long-continued application. According to Rossbach, the persistent use of cold does actual harm, the contracted vessels of the trachea and bronchi subsequently relaxing and suffering a kind of paralytic engorgement.[1]

The best results will probably be obtained by the intermittent action of cold, this being applied for two or three minutes every ten or fifteen minutes.

ON THE SPINAL ICE-BAG AND THE SPINAL HOT-WATER BAG

The profession is indebted to Dr. Chapman for the introduction of these appliances. They afford a convenient means of bringing cold and heat to bear upon the spinal region.

Concerning the spinal ice-bag, Dr. Chapman says, "I have proved by numerous experiments that cold applied to the back exerts not only a sedative influence on the spinal cord, but also on those nervous centres which preside over the blood-vessels in all parts of the body."

The claim which he makes is that, by means of cold applied along the spine he can cause vascular dilatation, with an increased circulation of blood in various parts of the body, head, trunk, and limbs. He says: "Those phenomena which Professor C. Bernard produced in the head of an animal by section of the cervical sympathetic I have induced in the head, thorax, abdomen, pelvis, and four extremities of man, by the application of ice to the different parts of the back."

To supply this increased afflux of blood to any part of the body, Dr. Chapman applies the ice-bag to various parts of the spine; to the neck and between the shoulders, when more blood is needed for the head; to the upper part of the back, for the chest and arms; to the lower part of the back, for the abdomen, pelvis, and legs.

He treats coldness of the surface generally, including the extremities, by the ice-bag applied to the whole length of the spine.

Dr. Chapman treats cold feet by the application of the ice-bag to the lower part of the dorsal and to the lumbar regions, and he asserts that this same application, by increasing the amount of blood supplied to the pelvic organs, promotes menstruation, and will even restore the suppressed monthly flux. I have often seen the feet become comfortably warm a few minutes after the above application of the ice.

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[1] Rossbach, *Festschrift*, Würzburg, 1882. *Ueber die Schleimbildung*. His results would be quite in keeping with the experience of Sir R. Quain and others, that the long-continued application of ice to the chest may set up bronchitis. (See *Quain's Dictionary*, article "Cold," by J. C. T l.)

Dr. Chapman further asserts that ice applied along the spine is extremely useful in cholera and tetanus, in sea-sickness, and the vomiting of pregnancy.

More accurate work is needed upon the reflex relationship between the various surface areas of the skin and the distant and deeper parts of the body. According to Winternitz, the application of cold to the feet influences the intracranial circulation chiefly, cold to the thighs the pulmonary circulation chiefly, and cold to the back the vessels of the nose in particular. Rossbach's experiments showed a powerful effect upon the tracheal mucous membrane, and probably also upon that of the bronchi, by means of the ice compress placed upon the abdomen. All these effects, however, were contractile, the circulation in the distant and deeper parts being diminished by the surface application of the cold; but cold to the surface may, in certain regions of the deeper parts, cause an increased circulation such as Dr. Chapman describes; thus, according to Foster, cold applied to the surface whilst constricting the vessels of the skin (chiefly by a reflex act) inhibits that portion of the vaso-motor centre which governs the splanchnic area, and so causes in this area an afflux of blood.[1]

The effect of heat applied to the spine is, according to Dr. Chapman, to cause contraction in those vascular areas which were relaxed by the application of cold. The temperature of the hot bag should not exceed 120°.

Dr. Chapman states that, if properly applied to the spine, the hot bag will not only lessen but will arrest the menstrual flow. He asserts, as the result of his experience, that it will arrest menorrhagia and bleeding from the nose and lungs. In bleeding from the nose or lungs the hot spinal bag must be placed along the cervical and upper dorsal vertebræ; in menorrhagia, along the lower dorsal and lumbar vertebræ.

THE INTERNAL USE OF WATER

A FEW remarks may be made here conveniently on the drinks best suited to fever patients.

The importunate and distressing thirst from which these patients suffer often causes much restlessness and irritability, and these symptoms in their turn often increase the fever. The urgent thirst must therefore be allayed, but if left to themselves the patients, to satiate their cravings, will always drink to excess, and this is very liable to derange the stomach, impair digestion, produce flatulence, and even diarrhœa. Theory and experience both show that drinks made slightly bitter and somewhat acid slake the thirst most effectually. A weak infusion of cascarilla or orange-peel, acidulated slightly with hydrochloric acid, was, with Graves of Dublin, a favourite thirst-quelling drink for fever patients. Raspberry vinegar is likewise a useful drink. A weak lemonade made from the fresh juice of lemons is suitable, also the old-fashioned imperial drink made from cream of tartar, one drachm to the pint. Sweet fruits, although at first agreeable and refreshing, must be taken with care and moderation, for they often give rise to a disagreeable taste, and are apt to produce flatulence or diarrhœa. The sucking of ice has been already mentioned as grateful to fever patients.

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[1] Foster's *Physiology*, 1888, vol. i., p. 348.

Rinsing the mouth with water as hot as can be borne will often relieve thirst, by removing the local discomfort upon which it depends more or less. Extremes of heat and cold may thus both be serviceable in the treatment of thirst.[1]

In the non-febrile thirst of diabetes there is not the same reason for lessening the quantity of fluid taken as there is in fever, and, according to Sir W. Roberts, there is no advantage in "curtailing beyond a moderate degree the amount of water drunk by diabetic patients. The urine and sugar may by this means be lessened, but the general distress is increased." Prout recommends tepid drinks in the thirst of this complaint.

Water is necessary both for the digestion and solution of food, but an insufficient as well as an excessive quantity are alike harmful. The character of fermentations, it is well known, depends on the amount of water present; for instance, in the case of sugar, if there is but little water present, no fermentation will take place, while, on the other hand, with excess of water, the acetous, instead of the vinous fermentation, will be set up. It is more than probable that the quantity of water taken with the food may, in a similar way, affect the changes which the latter undergoes in the stomach. This much is certain, that the habitual drinking of an excess of water with the meals often aggravates dyspepsia, and, on the other hand, indigestion appears in some cases to be connected with an insufficient intake. Flatulent dyspepsia is often traceable to excess of drinking at meal-times.

Too much water taken with the food impairs digestion, by over-diluting the gastric juice, and so weakening its solvent power. The popular idea proves to be correct, that drink should be taken chiefly at the end of the meal, when it serves many useful purposes; *e.g.*, it then aids the passage of the peptones from the intestines into the blood, and so favours the continuance of digestion, since it is held that the presence of these peptones hinders that process. Another important reason for leaving the chief intake of fluid to the end of the meal is, that mastication and insalivation are much more thoroughly done when we do not allow ourselves to wash down the mouthfuls with frequent potations: in this latter case the food is insufficiently prepared. Again, the draught of water at the end of the meal will assist those indigestible substances, which have been only partially dissolved in the stomach, to pass through the pylorus into the intestines, there to be subjected to further digestion or to be eliminated with the motions; thus a possible source of irritation to the stomach and intestines will be removed.

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[1] We may here mention the use of rinsing the mouth with very hot water in the treatment of toothache; it will often give relief, though occasionally cold water answers better.

In our desire to avoid the ingestion of too much drink, we must be careful not to err on the side of undue abstinence, for it has been shown that a proper amount of water favours the secretion of the gastric juice, and promotes the passage of the peptones into the blood. Iced drinks at meal-times are harmful by constringing the vessels, and preventing the secretion of the due quantity of gastric juice, and also by lowering for the time being the gastric temperature.

Chomel described, and Dr. Thorowgood has recently narrated, some cases of a form of dyspepsia, called by him "indigestion of fluids," and characterized by uneasiness after drinking, and a splashing noise heard on percussing the stomach or shaking the body, even when the patient has taken no drink for some hours. The best treatment for this curious indigestion is not to drink till some time after a meal, and as little as is compatible with comfort. Some of these cases will probably come under the heading of "dilated stomach," and more active treatment, as by *lavage*, may be required.

After the taking of an emetic, warm water, or various infusions, such as chamomile tea and mucilaginous drinks, are employed to promote vomiting. For this purpose, the quantity of fluid taken should not be too large, otherwise it will over-distend the stomach, and paralyze its muscular walls, thus impeding, instead of promoting, vomiting. Half a pint to a pint is in these cases a sufficient quantity.

The action of water on the intestines is similar to that upon the stomach; its presence is necessary for the absorption of the digested substances in this part of the canal.

A glass of cold water, taken early in the morning, acts with some persons as a purgative. The cankery taste, hot sensation in the mouth, and lack of appetite for breakfast experienced by many persons on waking is generally removable by drinking half a tumbler of pure cold water half an hour before that meal. In many cases a tumbler full of quite hot water may be substituted for the cold water, and will very advantageously replace the pernicious cup of tea taken in bed before breakfast.

A glass of cold water, taken immediately on leaving bed, promotes the reaction after the "morning tub."

On the other hand, a too free indulgence in fluids often increases or keeps up diarrhœa. It has been found that free water-drinking increases the water, but not the solids, of the fæces.

Water readily passes into the blood, but there are certain limitations. Thus, when the system has undergone great loss of water, this fluid is absorbed with much avidity, and its rapid passage into the circulation may materially affect the condition of the blood; indeed, this sudden and copious influx of water is said sometimes to destroy cattle through the rapid destruction of the blood-corpuscles by osmosis. When, however, the amount of water in the blood is already ample, the absorption of a further quantity from the stomach and intestines is much diminished.

Excess of water is eliminated in various ways. Some, as we have said, passes off by the intestines, much is thrown off by the skin and lungs, but most is excreted by the kidneys. In six hours the chief part is eliminated, though after strong exercise much water is retained in the muscles for a considerably longer period.

Copious drinking exerts on the urine a further action than that just mentioned; for not only does it increase the urinary water, but it also augments the solid constituents such as urea, phosphoric and sulphuric acids, and chloride of sodium. The augmentation of these constituents, with the exception of the chloride of sodium, is maintained more or less, but in respect of this latter salt the increase is only temporary, for after awhile its amount falls below the quantity excreted in health, and thus the previous increase is balanced; water must, therefore, be considered, in regard to common salt, as a temporary eliminator merely. The case is different, however, with urea, phosphoric and sulphuric acids; for water-drinking induces an increased elimination of these substances, the result of an increased formation; this can happen only from an augmented disintegration of substances containing nitrogen and sulphur. Did water-drinking exert a disintegrating influence solely, it would lead merely to a loss of weight, but, simultaneously with this rapid disintegration, a corresponding increase of integration takes place in the same tissues; whence it happens that water, taken under certain precautions, may increase both construction and destruction of tissue, and so act as a true tonic or promoter of metabolism, improving the vigour of both body and mind. These considerations suggest an explanation of the benefit often derived from the "water treatment" in hydropathic institutions.

The effects of water-drinking vary in different persons. The disintegration is greatest in weakly persons, in whom indeed this process may produce almost a febrile state. Disintegration is greater in children than in adults, and greater, perhaps, in women than in men. A high temperature of the water increases disintegration. Bodily exercise produces similar effects. (Parkes on *Urine*.)

An old and useful practice of drinking a tumbler of hot water twice or thrice a day, midway between meals, has recently been revived. It is useful in flatulent and acid dyspepsia. After absorption the water increases oxidation, and, by flushing the kidneys, tends to remove effete products from the blood. It is certain that many persons find much relief from this treatment. Methodical hot-water drinking plays an important part in the Salisbury dietetic treatment. (*See later.*)

ON ENEMATA

Rectal injections are used for a variety of purposes, *e.g.*, to procure evacuation of the bowels, to restrain diarrhœa, to ease pain about the region of the pelvis, to destroy worms, to introduce medicines into the general system, and to nourish the body in cases where food cannot be taken by the stomach. Injections are also used in certain cases of intestinal obstruction, as, for instance, in intussusception.

To secure each of these purposes certain points must be attended to in the administration of the enemata.

First, concerning injections used to relieve the bowels. It must be clearly understood that an enema seldom acts by merely washing away the fæces, for it will act efficiently when the fæcal matter is lodged high up the intestines, even in the transverse colon or cæcum. An injection stimulates probably the whole intestinal tract to a more vigorous peristaltic action, by which means the contents are propelled along the canal, and finally expelled. This result is brought about by a local distension of the lower part of the larger gut by the fluid injected; this distension starts a local vermicular action which soon spreads along the bowel to a greater or less extent. The object, therefore, is to *distend* the rectum and the adjoining part of the intestine, and an enema constantly fails because not enough fluid is introduced to excite contraction. For this purpose it is necessary to introduce a considerable quantity of fluid, as much, viz., as two, three, or even four pints; but any one who, for the first time, without due observance of certain precautions, attempts to introduce such a copious injection into the rectum, will in all probability fail.

When a large injection is to be given, the patient should be placed on the left side with the knees drawn up, and the fluid should then be pumped slowly into the rectum. After a variable, but usually short, time, the patient complains of inability to retain more, and suffers from colicky pain in the belly, and an urgent desire to empty the bowels. The pumping must now be intermitted for a while, and the patient directed to prevent the escape of the fluid; but if he is unable to control the sphincter, the administrator must help him. This can be done in several ways, each having for its object the support of the sphincter. The simplest, but not always the most successful, plan is to firmly press upon the perinæum and structures around the anus, either with the bare hand or with a folded towel. Should this support prove ineffectual, which is often the case after a con-

erable quantity of fluid has been introduced, further assistance is
rded by passing into the rectum, alongside the nozzle of the
ma-pipe, one, two, or even three fingers, as circumstances may
uire, and pressing them, with the nozzle, strongly upwards.
mulated in this way, the sphincter grasps the fingers firmly, and
ctually prevents the escape of the fluid, and with these precau-
ns, almost any amount of fluid may be pumped into the intestines.
m time to time the patient will complain of griping pains and an
ressive desire to go to stool; the pumping should then be stayed
hile, and recommenced as soon as these symptoms have passed
ay. The operation over, the patient must be directed to lie quite
et on the left side, and, if possible, to retain the fluid for ten
nutes or more, so as to ensure a more active and thorough evacua-
n of the bowels.

It need scarcely be mentioned that if the rectum or lower part of
large intestines is the seat of cancer, or is diseased in other ways,
ious injections, and the introduction of a long tube, are attended
h danger.

Sometimes the rectum and lower part of the gut are blocked to
tension with fæces, against which the injected fluid impinges, and,
ling no passage, of necessity flows back through the sphincter as
t as it is pumped in. One or two ways may be adopted to force
h a blockade. A hollow tube of some inches in length is passed
ough the impacted fæces, till its free extremity reaches the sigmoid
xure, or even higher. If the tube is passed through the accumu-
ion in the intestine, the injection can proceed easily. Should this
nœuvre fail, and the need is urgent to obtain an evacuation, then
o or three fingers, according to the yielding of the sphincter, are
be introduced into the rectum and the fæces withdrawn. This can
easily accomplished if the fæces are hard and firm. Obstinate con-
pation of this character occurs most commonly in diabetics. The
rd and almost stone-like fæces can be withdrawn easily by the
gers in the manner described, and much more may be withdrawn
an is contained in the rectum, for although the intestines may be
able to force the hardened fæces through the sphincter, they are
ite capable of propelling them from the sigmoid flexure into the
tum as soon as room has been made for them; consequently as
t as the fæces are withdrawn fresh supplies are propelled down-
rds within easy reach of the fingers. Of these two methods the
ter is certainly the most to be commended, for to inject the bowel
ve a distended or more or less paralyzed rectum is to put the
vel at a mechanical disadvantage.

Instead of the Higginson enema syringe many prefer to run the
ter into the bowel by its own weight. The apparatus necessary for
s is a rectal nozzle which should be conical, smooth and not too
all, and a soft rubber tube some two and a half feet long to connect

the nozzle with a funnel, which may be conveniently made of thin macintosh material. The patient may easily administer the enema himself with this instrument, the funnel-shaped reservoir being suspended so as to allow of a fall of 12 or 18 inches, more or less. The dorsal position with the pelvis raised will be a convenient one. By pinching the tube or by means of a stopcock, the inflow can be regulated at will. The flow from this apparatus is continuous and even, an improvement upon the jerky flow from the Higginson.

The so-called *forced enemata* should always be given in this way: these are very bulky enemata, from three to eight or nine pints. They are used when it is desired to reach the whole length of the colon with the injection, and they have been much employed in the treatment of invaginations into the colon, the distending fluid gradually unfolding and returning the intussusception. The posture of the patient may be as above, or on knees and elbows, or knees and shoulders so as to raise the pelvis.

Various fluids are employed as enemata. Sometimes simple water or gruel is injected; at other times, to one or other of these is added soap, turpentine, castor-oil. When castor-oil or turpentine is added to the injection, soap and gruel are generally employed to help to suspend them. It must be recollected that castor-oil and turpentine are lighter than water, and will float on its surface, and hence although they may have been thoroughly well mixed at the beginning, yet, as the injection proceeds, they will rise to the surface. As the tube of the syringe lies at the bottom of the vessel, the lower stratum of the liquid will be first injected, and much of the oil or turpentine either floating on the surface or sticking to the sides of the vessel will escape, while the small portion ultimately injected will operate only upon the rectum and the neighbouring intestines. The object in view should be to make the oil or the turpentine, as the case may be, rise as high up the canal as possible, so as to bathe and influence the mucous lining of the intestines. To this end the oil or turpentine, well beaten up with three or four ounces of gruel, or soap and water, should be first injected, and then the rest of the injection should be pumped in, so as to force the oil far up the intestinal canal. A tablespoonful of senna leaves infused for ten hours in cold water, and then warmed to 100° Fah., makes an excellent evacuant enema.

What should be the temperature of an injection? Tepid fluid is generally used; but some consider that an injection differing in temperature widely from that of the body acts more energetically on the tissues, and excites the intestines to more vigorous action. Thus cold or hot water may be used, and very cold water may be injected without inconvenience, and without the patient's cognizance of its temperature.

It is unadvisable to use warm evacuant enemata habitually, lest a torpid condition of the intestine ensue, and so ultimately the constipation become worse.

Firm kneading of the abdomen night and morning for ten minutes often overcomes chronic constipation, especially in children. This abdominal massage may be performed gently whilst the injection is in the bowel, if the latter show no tendency to expel its contents.

As we have said, large quantities of water are employed to unload the bowels, but this is not the sole use of a free injection. If used comfortably warm, it is very soothing to the intestines and to the neighbouring organs. Thus warm injections will often much mitigate the pain of cancer, either of the intestines or of the adjacent organs; further, injections often greatly relieve the very distressing desire to evacuate, with straining, but without any relief, which occurs in intestinal cancer. Warm injections soothe the pain of cystitis, prostatitis, abscess of the prostate, and pelvic and abdominal pains generally. (*Vide* Opium and Belladonna.)

In some instances of suppression of urine copious injections appear to act beneficially.

In cases of much flatulent distension of the bowels the addition of turpentine or assafœtida to the injection gives great relief. A tablespoonful or two tablespoonfuls of turpentine is enough, and it must be thoroughly mixed with the injection, or it will cause much irritation and smarting at the anus.

Injections are often successful in restraining obstinate or dangerous diarrhœa. It is by no means necessary for the injection to reach that part of the intestines upon which the diarrhœa depends, for, whether the mischief is situated in the small or large intestines, the injection is equally beneficial, owing, no doubt, to the close sympathy which exists between the different parts of the intestines, wherefrom an impression made on one part is communicated to the other. In restraining diarrhœa a small quantity only should be injected, otherwise the intestine will be stimulated to contract and expel the enema, whereas it is important that the fluid should be retained as long as possible, in order the more effectually to influence the bowels. An injection of an ounce, or at most two ounces, is sufficient for an adult, and this may be repeated several times a day, according to the urgency of the diarrhœa.

The material used in such enemata is starch, boiled or raw, of the consistence of cream, and at a temperature of 100°. An injection composed simply of starch proves effectual, but its sedative action may be much heightened by the addition of some drops of laudanum, varying in quantity according to the patient's age and condition. The addition of some acetate of lead or sulphate of copper renders this injection astringent as well as sedative. These injections are invaluable in cases where delay is death. They will save many a life in the choleraic diarrhœas of children, which so rapidly prove fatal unless speedily restrained. The diarrhœa of typhoid fever, which, if excessive, adds extremely to the patient's danger, yields generally to these injections, so also does the diarrhœa of phthisis.

Astringent and stimulating injections composed of a pint of water and containing three to twenty grains of sulphate of copper, nitrate of silver, or sulphate of zinc, prove of great service in restraining the troublesome diarrhœa of chronic dysentery. In the earlier stages of dysentery large emollient enemata prove useful by removing the fœtid discharges and soothing the inflamed mucous membrane.

Injections are frequently used to destroy thread-worms, which infest the rectum and the intestines in its immediate neighbourhood, but occur in no other part of the canal.[1] As the object of the injection is to destroy these entozoa, a quantity of fluid should be employed sufficient to reach a little higher than the rectum. For an adult half a pint is adequate, and for a child, of course, less. To the water injected various substances can be added, such as common salt, tincture of perchloride of iron, lime, quassia, and various other similarly acting vermicides, with the object either of directly poisoning the worms, or of destroying them by coagulating the albuminous structures of their bodies. Injections are always successful in removing worms, and thus afford temporary relief, but it must be recollected that the morbid state of the mucous coat of the intestines favours the production of worms, and must be remedied if permanent relief is to be obtained. A teaspoonful of salt, or a drachm of the tincture of steel, to half a pint of water; or this same quantity, half a pint, of the lime-water or infusion of quassia of the Pharmacopœia, these injections are adequate to effect the destruction of these delicately formed organisms. Solutions too concentrated must not be injected, otherwise inflammation of the mucous membrane may be occasioned, severe enough perhaps to cause sloughing in the rectum and margins of the anus.

Nutritive enemata are employed in stricture of the œsophagus, or when tumours press upon this tube and render swallowing impossible, also in persistent vomiting, and in painful diseases of the stomach, such as chronic ulcer. It is often taught that a nutrient enema should not exceed three or four ounces of bland, unirritating material, that otherwise the lining membrane of the rectum will become irritated and inflamed, a condition adverse to absorption or even retention. But if the injection be administered very slowly, much larger quantities may be given,—ten, fifteen, or even twenty ounces, and there is this advantage in the larger bulk, that the injection requires less frequent repetition. For these large injections, once in eight hours is generally sufficient; the frequency should never exceed once six hours. The temperature of the injection should be that of the dy; the administration should be very slow and gentle, a quarter an hour or even twenty minutes being occupied, and the posture of e patient should be either dorsal or left lateral with the pelvis ised. The object in view is, if possible, to get the fluid into the lon above the rectum. The long tube of the Higginson or a catheter be may be used. The manipulation must be *very gentle*, since it is l-important to avoid any irritation. The funnel enema is probably etter than the Higginson because of its even and controllable flow. ilk 10–15–20 ounces, with one or more eggs, the whole well pancreatized before administration, is amongst the most suitable mixtures r use. *Just before injection* brandy may be added, if necessary, to he extent of one or two tablespoonfuls to the enema.[1] Dr. Duffin, of King's College Hospital, gives injections of as much as a pint and a alf, the time of administration being very prolonged,—one hour or ver.

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[1] Cobbold states that these worms inhabit the whole length of the large intestine, and may be even present in the adjacent parts of the ileum, and he accordingly lays more stress on internal remedies and on brisk purgation.

In all cases the bowel should be daily washed out with a large nema of plain water.

It goes without saying that if the large nutritive enema is not lerated, the bulk must be reduced, if need be, to four or five nces.

From experiments on dogs, M. Bauer finds that the large intestines sorb peptone freely, but that pure soluble albumen is not absorbed, ough it is taken up readily on the addition of salt. Acid solutions albumen, such as meat dissolved in weak hydrochloric acid, are also eely absorbed. Fats and starches injected into the large intestine il to support life for any considerable time. It sometimes happens at the rectum will not retain even four ounces; this inability is ore liable to occur after injections have been continued for some ne. Before giving a nutritive injection, it must be ascertained at the rectum is not filled up with fæces.

Dr. W. O. Leube employs the pancreas of the ox or pig as a ferment; one part of finely minced pancreas being mixed with three rts of scraped meat rubbed well together with warm water, so that e mixture is easily injected. Fat, not exceeding one-sixth part of e meat, may be added. This injection is retained from twelve to irty-six hours, and the stools which are passed during such alimentation possess generally a normal fæcal character. From experiments on dogs, Dr. Leube has proved that by means of injections a nsiderable quantity of nitrogen can be taken up into the system.

The actual quantities for Leube's injection will be one ounce of ncreas (ox or pig), three to four ounces of lean meat, two or three blespoonfuls of warm water—the whole rubbed up together and ickly injected through a wide-mouthed nozzle. These quantities may be doubled or trebled. The commercial pancreatic extracts may replace the pancreas.[1]

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[1] Cf. Wood's *Therapeutics*, ed. ix., p. 36.

Peptones made into suppositories are also serviceable.

Three to five eggs beaten up with four ounces of a 20 per cent. solution of grape sugar form an excellent nutritive enema. Eggs are absorbed without peptonization.

In other sections, whilst treating of individual drugs, various additional uses of enemata are pointed out.

ON ACUPUNCTURE, ETC.

ACUPUNCTURE is performed by means of stout needles, which are generally round, and for convenience are set in handles. It is a very successful mode of treating lumbago. It will rarely fail to afford relief, and in many cases it will cure at once, though the lumbago may have lasted a week, or even three weeks. It succeeds best in typical cases of lumbago, when the loin muscles of both sides are affected, and the pain is most severe on a to-and-fro movement. I have treated a large number of such cases by acupuncture, and find that it gives almost instantaneous relief. It is generally sufficient to run the needle once deeply, say an inch, into the muscles on each side of the spine, over the seat of greatest pain or tenderness. Perhaps it may be better to leave the needles for a few minutes sticking in the back, but I have hitherto found this proceeding unnecessary. Some recommend that the needles should be left in for from half-hour to two hours.

In general, when the needles are first withdrawn, the patient says the pain is slightly eased, but presently it decreases rapidly, and in three or four minutes it is entirely gone, except, perhaps, for a little stiffness still remaining; even this may be absent. The patient, who just before could not bend in the slightest degree without the greatest pain, who could not possibly stoop to touch his toes, now bends backwards and forwards with the utmost ease, often with a look of astonishment mingled with incredulity, as if the cure were too wonderful to be true.

Faradization of the back is in my experience almost as successful as acupuncture, though the pain returns more frequently than after acupuncture. Under either treatment it sometimes happens that after several hours of relief the pain returns, and a renewal of the treatment may then be almost without avail, or its influence may rapidly grow less and less. Freezing the back with the ether spray or with Arnott's ice mixture is also very successful. So also is the old-fashioned method of ironing the back; a common flat iron, as hot as can be fairly borne, being passed over a piece of brown paper placed across the loins. The thermic hammer, too, succeeds often in subduing lumbago. These several modes of treatment I have found not so successful in the less typical forms of lumbago; for instance, in cases where the pain on movement is restricted to one side, or is felt only on twisting or turning the body, and not on bending it to and fro.

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[1] The injection must not be delayed or the meat fibres will swell up and be difficult to force through the nozzle.

Lumbago is not uncommonly associated with sciatica or shooting pains along some branches of the lumbar nerves, the pain sometimes shooting along the skin to the front of the body, and along the lumbar or sacral plexus, and assuming a neuralgic character. When these two pains are associated, I find that it is easy to cure the lumbago, but that the sciatica or other neuralgic complication is far more difficult to dispose of. These compound cases are generally obstinate, and the neuralgic factor most so. Acupuncture proves useless when lumbago is accompanied by high fever, or when it is the first symptom of acute rheumatism.

It is a good plan, when rid of the lumbago, to apply to the back a plaster of belladonna, or of lead, or a Burgundy-pitch plaster spread on leather; this plan is good both on account of the warmth and the support it affords. The Burgundy-pitch plaster sticks closest, but it is very apt to irritate delicate skins, especially in warm weather, and often indeed it cannot be borne. Even the lead or belladonna plaster may irritate the skin, bringing out a papular or eczematous eruption, due in part to the retention of perspiration, which, decomposing, irritates the skin. By removing the plaster every few days, wiping it, and washing the skin, and then reapplying the plaster, this irritation may often be avoided, or we may seek to prevent this irritation by having the plaster perforated after the manner of Alcock's porous plaster.

I have found acupuncture far less successful in the treatment of sciatica than of lumbago; in a few cases it acts no doubt as speedily and as completely, but this prompt action is unfortunately the exception. Some hold that it is necessary to pierce the nerve, and the uncertain results of acupuncture in sciatica may possibly be due to the needle sometimes impaling the nerve, but more frequently missing it. This treatment generally gives some, though usually very transient, relief, *e.g.* from a few minutes to an hour or so. In cases due to diseased spine, diseased hip-joint, or to pressure on the nerve from abdominal solid tumours, abscesses, or fæcal accumulations, acupuncture is not appropriate.

In treating sciatica by acupuncture the needle must be thrust in deeply, even to the bone, at various points over the seat of pain along the course of the affected nerve. When only partially successful, this treatment is apt to remove the pain along the course of the sciatic nerve, but to leave unaffected the pain below the knee, especially that outside the ankle. I may add that whilst all forms of sciatica are obstinate, those cases are most rebellious in which the pain reaches below the knee, or in which it is restricted to the region above the sciatic tuberosity.

Dr. Dumontpallier finds that acupuncture of a spot—not the painful one, but the spot corresponding to this on the opposite side of the body—will relieve the pain of neuralgia, acute articular rheumatism, pleurodynia, the relief being in some instances permanent. This "corresponding spot" is sometimes tender; acupuncture over or near the seat of pain also gives relief.

Acupuncture, or incisions, into the dropsical tissues of the feet and ankles, or lower part of the calf, is an old, but now too much neglected mode of treating both cardiac and renal dropsy. Acupuncture, no doubt, excites sometimes an erythematous inflammation, sufficient to cause the dropsical and vitally depressed tissues to slough extensively and progressively. In one instance I have seen the muscles not only laid bare, but dissected out over the lower part of the calf to the extent of eight square inches, yet in this case, after the dropsy had drained away, the tissues, recovering their lost vitality, healed, and the man left the hospital greatly improved. As Mr. Beck points out, the needles for this form of acupuncture should be triangular, not round, so as to give a better wound for oozing purposes, but it is still better to make incisions with a scalpel instead of pricks with the acupuncture needle. If incisions, these should be from three-quarters to an inch long, and should reach well into the subcutaneous tissue; if punctures, three or four such should be made around each ankle with the ordinary exploring trocar, thrust up the leg into the subcutaneous tissues for an inch or an inch and a half. The legs should then be kept dependent and the wounds covered with lint or sponge soaked in hot boracic acid or carbolic acid solution. The feet and ankles should also be placed in hot boracic water for an hour night and morning, in order to aid the escape of serum, and at the same time to keep the part aseptic. Dr. Southey's well-known plan is highly useful in many cases.

As the discharge decomposes quickly and becomes offensive, the cloths and sponges used should be washed in a solution of chlorinated soda, or moistened with a weak solution of carbolic acid; a rigorous antiseptic treatment is of very great importance. These free incisions allow of the easy escape of the dropsical fluid, to the relief of the distended and depressed tissues in the neighbourhood of the incisions, thus lessening the likelihood of inflammation and sloughing, both of which are very apt to occur after mere pricks. One incision over each outer malleolus is generally sufficient.

With regard to incisions, though there is not much fear of sloughing, still, as this untoward event may occur, it is better not to incise till other methods have been tried and have failed; this holds especially in the case of very old or very weak patients. The benefits of incisions are prompt and striking. Serum runs freely from the wounds, to such an extent that in a few hours pints may be discharged. As the fluid runs away, the dropsy, of course, grows less, first of all in the upper parts of the body, pleura, and abdomen; and with this the dyspnœa, due to hydrothorax, and to the tension in the upper part of the abdomen, ceases. At last the fluid drains out of the legs, and all the dropsy is removed, and this without the production of depression, for the dropsical fluid from the subcutaneous tissues, unlike inflammatory exudations, contains very little albumen, so little that on boiling, and the addition of nitric acid, it only becomes opalescent.

If the subcutaneous tissue is hard and brawny, and pits only imperfectly, then neither incisions nor Southey's tubes will drain off the fluid.

How long will it be before the fluid re-accumulates and the advantage thus gained is lost? In tricuspid dropsy, so long as the valvular incompetency continues, the dropsy will return, and the rapidity of its recurrence will of course depend on the degree of regurgitation. In aortic dropsy, and the dropsy of Bright's disease, success is often much greater. In some cases one operation often dissipates the fluid, never to re-accumulate; though more often two or even more operations, at varying intervals, are necessary, the fluid each time returning less and less rapidly. In cases of very extensive dropsy, strange to say, I have known the fluid not to return, although the disease of the heart or kidneys has remained unaffected. Thus, the amount of albumen, and the quantity of urine, has remained just the same in cases of Bright's disease, and yet after draining away the dropsy it has never returned. I have seen this excellent result in a case where the tissues were shiny with distension, the abdomen largely distended with fluid, and the albumen, on boiling the urine, occupying half the test-tube, yet, after draining away the dropsy by incisions, the fluid never re-accumulated, though the proportion of albumen continued the same. This patient remained free from dropsy for more than six months after the operation.

IRRITATION AND COUNTER-IRRITATION

CANTHARIDES applied to the surface of the body soon excites tingling, smarting, and a sensation of heat; the papillæ of the skin quickly become reddened and raised; next, in a variable time, determined by the strength of the application, minute vesicles form on these papular elevations, which gradually enlarge, and by their lateral extension soon coalesce, so as to form blebs of various sizes, filled with a fluid rich in albumen, and generally containing some fibrine.

It is of great importance to bear in mind that the effects of these applications are very different according to the result, viz., whether extensive vesication is produced or simply reddened skin, with the formation of a few small miliary vesicles. Dr. Graves insisted on the different and even opposite effect of blistering agents, according to the degree of their action. The primary action of any powerful irritant is that of a stimulant to the body generally, and to the individual organs in whose neighbourhood it is applied, but if allowed to remain long enough to produce much vesication, and to form large blebs, it depresses the bodily powers in proportion to the amount of serum withdrawn from the vessels, and hence lost to the system,—this lowering effect is often exemplified in weakly people, who, through the abstraction of a large quantity of serum, are apt to remain weakened for several days. As the serum of blisters contains nearly as much albumen as the blood itself, we might almost as well bleed the patient to the same amount.

Should it be held desirable to reduce somewhat the patient's strength and to produce simultaneously a counter-irritant effect on any of the individual organs or tissues of the body, then a blister may be applied, even to vesication; but as the good effects of blistering are for the most part ensured by milder measures, treatment so energetic and so depressing is seldom called for.

Dr. Graves employed blisters frequently as a general stimulant in certain critical conditions. In acute diseases, such as the idiopathic fevers and in inflammations, a patient, already much prostrated, is liable to drift into a dangerous, apathetic, and unobservant state, which may go on till it even reaches partial insensibility or coma; in this state he can be roused only with difficulty, and incompletely, wearing a stunned, stupid, vacant aspect, and understanding, it is evident, very imperfectly what is said to him. With this depressed mental condition the body, generally, sympathises, its functions becoming more and more languidly performed, till those necessary to life cease altogether. This is a condition which may be compared, not inaptly, to that produced by opium-poisoning, in which the partial coma is accompanied by a lethargy in the functions of the whole body, whose activity diminishes as the coma continues and deepens. Now a patient in the partially comatose state of which we are speaking, gets no true and refreshing sleep, yet sleep is urgently needed, and an opiate, together with plenty of stimulants carefully given, will often produce a refreshing slumber, from which the patient awakes strengthened and much improved. (*See* Opium.) When the functions are very languidly performed, this blistering treatment may well precede the use of opium.

In the precarious condition above described, it is essential to rouse tient from his lethargic state. This accomplished, the bodily tions will act with renewed force, and he will pass from imminent ger to comparative safety. To effect this, large blisters or mustard ltices should be applied for a short time, in quick succession, to ous parts of the body; for instance, the chest, the abdomen, and thighs and calves. The great value of such applications in these umstances will be the better appreciated if we bear in mind that critical condition just described generally occurs near the end of cute illness, when, if the patient can be kept alive for one or two , the immediate danger of death passes away, acute diseases ng a definite duration. Counter-irritants, by rousing the patient, spurring the flagging vitality, may thus rescue an almost hope-life.

e term "flying blisters" is given to this local application of ants for periods of time insufficient to cause vesication. It is ult to estimate this negative period for each case, since indi-als differ so much in the susceptibility of their skins, but Whitla's is in general reliable. He orders the blistering plaster (Emplas- Cantharidis B.P.) of the size required, to be applied for one , removed and the same plaster reapplied for another hour in the ediate neighbourhood; again removed, and reapplied a third time fresh place adjacent.

eparations of cantharides may be applied as stimulants to special of the body; for instance, if in the case of a general condition that just described, there is fear of hypostatic congestion of the s, or of pneumonia, in which such congestion often ends, flying ers applied to the chest, and perhaps, as recommended by Dr. es, along the course of the pneumogastric nerves, may, by bracing he vessels, avert a serious and often fatal complication. In like ner we may stimulate the heart, and, in states of intense weakness, igthen its contractions temporarily, by flying blisters or mustard tices placed over the precordial region; this done, we then maintain advantage thus gained by the free administration of alcoholic ks.

ying blisters are employed largely in various diseases of the -seated organs, such as pleurisy, pneumonia, asthma, biliary and l colic, etc.

listers are frequently employed in pneumonia and pleurisy. Yet t divergence of opinion exists, not only as to the stage of the se in which they are useful, but even as to their utility in any . Some maintain that during the febrile stage blisters increase fever, but the increase, if any, must certainly be very slight, for ve not been able to excite fever in fever-free persons by blistering, have I ever seen it increase a fever already existing. The advo-s of blistering in pneumonia and pleurisy maintain that it removes , quiets cough, and lessens expectoration; many competent au-ities, however, discredit its use in these inflammations.

Whatever doubt may exist as to the influence of blistering on the inflammatory process in acute pneumonia and pleurisy, most observers agree that it lessens the pain; but, if so, it must therefore benefit the patient by subduing the restlessness, oppression and sleeplessness consequent on pain. In estimating the effect of blistering, it must be recollected that in these acute affections the severe pain is of short duration, and spontaneously lessens or disappears in about forty-eight hours. It is, perhaps, not superfluous to re-caution against too free vesication.

Opinion is more agreed on the usefulness of counter-irritation in pleurisy at a later stage, viz., after the subsidence of inflammation and fever. Then the prompt application of large flying blisters, often repeated, promotes the absorption of the fluid in the pleural cavity, and lessens the risk of the disease becoming chronic. The counter-irritant, as we have said, should be frequently and briefly applied, to the avoidance of vesication, which, if it occur, should be healed at once, for all the good of counter-irritation is effected during the first period of stimulation. The notion that free vesication and the maintenance of the discharge by some irritating ointment will drain off the fluid from the pleural cavity, is altogether fallacious. This barbarous treatment withdraws important nutritive material from the system and weakens the patient at a time when strength is most needed. Many consider that counter-irritation is worse than useless when the pleural effusion has lasted a long time. As to this the production of a free discharge of serum is, no doubt, useless; but although in a long-standing case of effusion there is but slight chance of improvement by any treatment, yet mild flying blisters will in some cases help the absorption of the fluid, and at any rate may prove serviceable, if in no other way, than by removing the troublesome intercostal pains which often accompany chronic pleurisy; for this latter purpose, however, the counter-irritation of a mustard poultice is to be preferred.

Flying blisters and vesicating blisters are valuable in the treatment of acute pericarditis, especially as a means of relieving pain.

Counter-irritants are often of signal service in removing the oppression of the breathing in asthma, especially bronchitic asthma and the shortness of breath accompanying bronchitis with emphysema.

They relieve the pain arising from the passage of renal and biliary calculi.

Counter-irritation is useful in many other diseases, such as phthisis, rheumatism, gout, pleurodynia, sciatica, phlebitis, facial paralysis, and in the discharges of gleet and leucorrhœa, etc., a rather motley assembly, but having in common local states of pain and inflammation more or less chronic. It is these local conditions which the counter-irritation attacks.

In the first member of the group, phthisis, counter-irritation is very beneficial in certain forms of the disease. In the acute and rapid rms it is of little service other than to remove pain. But when the sease is chronic, when the cough is paroxysmal and violent, or fre-ent and distressing, preventing in either case rest and sleep, active unter-irritation of the chest, corresponding to the seat of the disease, ten relieves quickly, quieting the cough, diminishing the profuse pectoration, and thus obviating a severe drain on the strength. In plying a blister to these weakly patients, vesication, except on a very nited scale, must be avoided, or the exhaustion produced by the loss serum may be so great as even to endanger life. In phthisis iodine niment is on the whole a better counter-irritant than cantharides; ut, at the same time, an occasional small blister allowed to produce s full effect is very useful, in particular in the treatment of the calized pleuritic pains which are liable to arise. Phthisical patients, oreover, are of all degrees of vitality.

In inflammation of the superficial veins a blister applied over the urse of the inflamed vessel reduces the inflammation, hastens sorption or liquefaction of the coagulated blood, and assists the storation of the circulation through the obstructed veins.

Blistering is of the greatest service in neuralgia. A flying blister the temple or behind the ear generally relieves frontal or facial uralgia. The obstinate form of facial neuralgia dependent on a seased tooth, rebellious to most treatment except extraction, often elds to a blister, the neuralgic pains ceasing, although the tooth-he may continue. Blisters relieve the shifting neuralgic pains mmon in nervous, sensitive women, although the pain is apt soon to upon another nerve; flying blisters will drive it from place to ce. In this migratory form the pain may be confined to a few rves or may affect in succession a large number, producing in dition great cutaneous tenderness; or, the nerves supplying e viscera may be affected, and functional disturbance, such as usea, sickness, diarrhœa, etc., result without pain. This form of uralgia, though it is true the disease lacks many of the more stinctive characters of neuralgia, is most difficult to cure. The stinate intercostal neuralgia left by shingles, and occurring mostly old people, generally yields to blisters. Anstie here points out that isters applied over the seat of pain often aggravate the suffering; but that, on the other hand, if they are applied to a posterior branch the spinal nerve trunk from which the painful nerve issues, a reflex often produced of the most beneficial character."

Blistering paper, because mild in its action, requires to be applied for me hours; this generally suffices to produce enough irritation to lieve facial and frontal neuralgia, but if the pain should continue unated, a stronger preparation of cantharides must be tried.

Blisters are of the greatest service in sciatica. They should be plied every day or every second day along the course of the sciatic rve, and should extend in severe cases from the buttock to the knee.

In these cases free vesication sometimes succeeds when slight vesication fails. Other counter-irritants are also useful in neuralgia, such as mustard poultices, mustard leaves, croton-oil liniment, iodine paint, etc., but cantharides is superior to them all.

Blisters behind the ear, and especially to the temple, are very useful in rheumatic, gouty and simple inflammations of the eye; they relieve pain quickly, and subdue inflammation, though less rapidly. As it is important to repeat the application frequently, blistering paper is preferable to stronger preparations, but in the treatment of conditions of the eye we may desire to vesicate, *e.g.* in cases of subacute glaucoma, cases, *i.e.* which permit of some delay. Obstinate forms of tinea tarsi sometimes yield to repeated applications of flying blisters to the temples. Counter-irritation, by blistering fluid or croton-oil liniment, applied behind the ear, often removes earache.

Counter-irritation at the epigastrium often allays pain and obstinate vomiting, due to disease of the stomach.

Mr. Furneaux Jordan employs counter-irritation to remove enlarged glands, etc. "In enlarged glands, in abscess, carbuncle, boils, erysipelas, the best locality for the counter-irritation is around, or adjacent to, the disease. Blisters or iodine may be employed." "In enlarged cervical glands a large patch of iodine irritation at the back of the neck, which may be prolonged below the glands, will certainly prove successful in a short time."

Dr. McCall Anderson recommends blistering in erythematous lupus, and in chronic skin affections, especially in eczema of the hands, where the thickened and cracked tissues hinder free movement.

In paralysis of the seventh nerve, dependent on alterations in the nerve trunk and its branches, and often caused by draughts or exposure to cold, painting the skin over the paralyzed muscles with blistering fluid will sometimes quickly remove the palsy. The earlier the application, the greater the probability of good results.

A blister applied to the perinæum and along the course of the urethra will sometimes cure a gleet obstinately rebellious to all the usual methods of treatment.

Blisters are of the greatest service in rheumatism. Large flying blisters, applied in proximity to an inflamed and painful joint, often remove the pain quickly, and with the ease thus brought about sleep often ensues, and a concurrent general improvement takes place in the patient's condition. But blisters have been of old recommended as the sole or chief treatment of acute rheumatism, and some apply them, to the extent of free vesication, in the unfounded hope of removing from the blood the poison on which rheumatism is supposed to depend. This method has the disadvantage of reducing the strength of the patient in proportion to the quantity of serum lost, the depletion tending both to prolong the attack, and to retard convalescence. This, however, after a severe attack of rheumatic fever—a disease which induces ore anæmia than most other affections—is usually sufficiently tedious. he advocates of free vesication assert that this method moderates d shortens the attack, and lessens the danger to the heart; some, oreover, attribute its efficacy to the influence large blisters have the urine, changing it in a few days from the acid condition of eumatic fever to a neutral or even alkaline state. On this subject think that due regard has not been paid to the great influence hich age exerts on the duration of an attack of rheumatic fever; the ported cases also do not appear not to have recovered more speedily han frequently happens in persons of the same age, manifesting the ame body temperature, yet who have received no medicine. Blisters re rarely used now in the treatment of acute rheumatism, except as djuvants.

The nightly application of a small flying blister placed at or near he part affected greatly relieves the pain and swelling of chronic nd subacute gout, gonorrhœal rheumatism, and chronic synovitis; ut if this mild application fail, strong vesication should be tried.

Pleurodynia usually yields to anodyne liniments or mild counter-ritants, but sometimes strong vesication is necessary, although the eakening caused by the loss of serum may increase the pain for a ay or two.

Size of blister, mode of application, etc. It is surprising how much lief a small blister no larger than a florin will often give in the regoing diseases. Indeed in many cases it is better to apply a nall blister nightly to adjacent parts rather than to apply a single rge blister. For the relief of pain such as neuralgia, pleurodynia, of spasm, such as the attack of asthma, etc., a blister the size of a ve-shilling piece is generally sufficient.

The active principle of cantharides being soluble in oil, it is useful smear a little simple oil over the surface to be blistered; the oil, oreover, helps to bring the plaster more completely in contact with e skin. The blister should be secured in place, and prevented from ifting, by adhesive plaster.

It must be borne in mind that blistering paste and blistering paper quire several hours to produce a blister, and that the blistering per rarely produces much vesication.[1] If a speedy and sharp action necessary, we must employ blistering fluid, which sometimes vesi-tes in twenty minutes to half an hour.

The active principles of the Spanish-fly may become absorbed by e skin in quantity sufficient to produce congestion of the kidneys, rangury, and other characteristic toxic effects; hence, in the treat-ent of acute or chronic Bright's disease, where the kidneys are ready affected, cantharides should be avoided, since we are unable to regulate the quantity which may be absorbed, and a damaging amount may be taken up by the skin. The above-mentioned practice of smearing on oil before applying the blister has been said to protect to some extent from absorption, the oil holding the cantharidin in solution and acting upon the surface but not readily passing through the skin. (Pereira.)

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[1] In the Continental and United States pharmacopœias there is a convenient ntharides collodion, the *collodium vesicans*.

We hope it has been made sufficiently plain that, in a large proportion of cases, preparations of cantharides should not be applied long enough to cause much vesication. Should the raising of a blister be desirable, however, or should it have taken place, the vesicles should not be opened, but be covered with a layer of soft cotton-wool, till the effused serum is absorbed; a superficial desquamation then follows, and no troublesome consequences need be apprehended. If blistering has been carried far enough to produce blebs, the serum will not become absorbed, and the bleb will at last burst; but even in this case it is not advisable to open the blister until the last moment, so that the underlying dermis may have first healed partially, after which no ulceration need be feared. If, however, the bleb is obviously about to break, puncture with a clean needle at the most dependent part, and then the application of carbolic oil on a pad of cotton-wool, may be the wisest proceeding. If the bleb breaks or is punctured, the air will probably irritate the raw surface, producing much inflammation, which may end in extensive sloughing, an untoward event, especially apt to follow the blistering of young children, or of old people, or of persons in broken-down health, such as the victims of Bright's disease, etc. In such cases, it is generally considered advisable to use other counter-irritants. (*Vide* Mustard.)

CARBON. ANIMAL CHARCOAL. WOOD CHARCOAL

Carbon, in proportion to its porosity, absorbs many gases, some in considerable quantity. Wood charcoal being more porous than animal charcoal, its absorbing powers are greater.

Charcoal does not absorb all gases in an equal degree; thus it will absorb but little hydrogen, though it will take up a considerable amount of oxygen, and of sulphuretted hydrogen, and a still greater proportion of ammonia. Charcoal is much used on account of this property as a means of removing bad smells, or preventing the air in rooms from becoming contaminated by the effluvia from foul ulcers. Its non-volatility renders it very inferior to chlorinated lime or chlorine gas and other volatile agents for purifying air, since it can act only on the air which happens to be in immediate contact with it.

It is more effectual in absorbing the offensive gases given off by res, and is employed in the form of a poultice, mixed either with bread or linseed-meal. Bread, being more porous, is to be preferred, as it permits the gases to permeate the substance of the poultice, and so to come into contact with the particles of charcoal.

After becoming thoroughly moistened, and its pores filled with water, it may reasonably be doubted whether the charcoal does not lose its capacity to absorb or oxidize gases, and so to act as a deodorizer, and it is certain that charcoal poultices often fail to act in the above manner. Charcoal may however act in some other, at present unexplained, way, for when swallowed after admixture with water, and its pores have been thus filled or obstructed, it is still able to prevent flatulence, an effect scarcely to be brought about by absorption; it must, therefore, act here by arresting fermentation or decomposition. Still it is probable that in the dry state it is more active, and it will be found a thoroughly efficient mode of employing charcoal locally is to fill a small flat muslin bag with it (in a finely granulated form), and to place it over the poultice covering the sore, so that any escaping gases will have to pass through its particles.

Charcoal poultices are reputed, on doubtful grounds, to clean and heal sloughing or gangrenous wounds.

How does charcoal destroy smells depending on noxious gases? It has been stated already that it is endowed with the property of condensing many gases in its pores, and some accept this as a sufficient explanation of its action. Others assert that the oxygen condensed and accumulated in the pores of the charcoal, combining with the other gases with which it comes in contact, burns them up and destroys their ill odour: in this way it would appear that it does rapidly oxidize and destroy sulphuretted hydrogen.

A question of more practical importance is whether the carbon becomes inert by use, thus losing its property to condense gases or to destroy them. Buchheim is probably right in stating that the carbon does become inert, but others assert that if kept dry, it will retain its properties unimpaired for many years. In any case exposure to a dull red heat restores to the charcoal its gas-absorbing power.

Dr. Stenhouse has ingeniously devised a charcoal disinfecting respirator, which, no doubt, will protect the wearer against many gases, but at present no evidence exists to show that charcoal will destroy the organisms which propagate disease, although, by the mere act of filtration, it may prevent their entrance into the system. This mechanical action it would, however, share with any other finely-divided powder.

Charcoal, by its chemical or mechanical action, possesses the property of carrying down from solutions many colouring matters, many bitter substances, alkaloids, and mineral substances. Hence Sir A. Garrod has advised its administration in poisoning by corrosive sublimate, arsenic, morphia, strychnia, belladonna, etc.; up to the present, this treatment has not found much favour with the profession. It is said that half an ounce of charcoal is required to counteract one grain of alkaloid; accordingly large doses of the drug, viz., half an ounce to an ounce, or even more, must be given.

Charcoal precipitates the colouring matter of urine, carrying down at the same time all the uric acid, and some of the urea. The sugar of diabetic urine is unaffected by charcoal. As a precipitant, animal charcoal freed from its earthy impurities is found to be more efficacious than woody charcoal, on account, it is said, of its more finely-divided state.

Charcoal is employed with much success in certain diseases of the stomach. It is said to ease the pain of chronic ulcer, and of neuralgia of the stomach; possibly it does so by checking fermentation, and so preventing the formation of acids which must irritate the stomach, especially when ulcerated. It is markedly useful in flatulence. In the majority of cases, if not in all, intestinal flatulence is the result of gases generated by fermentation. The symptoms accompanying flatulence, however, are not always alike, and their varied character affords indications for treatment. Sometimes "the wind" is produced in enormous quantities, and with great rapidity, producing distension and eructation; along with these there is mental depression, the patient complaining of these symptoms only, not of pain or of acidity. This enormous production of wind, irrespective of other symptoms, prevails chiefly among middle-aged women, especially at the change of life. The condition is met with sometimes during pregnancy and suckling, sometimes, but more seldom, in the course of phthisis. It is often very difficult to check this formation of wind, but vegetable charcoal is one of the best remedies. The time of administration is of importance: sometimes after a few mouthfuls of food the wind is formed in quantity so large that the patient is constrained to cease eating; here the charcoal should be taken immediately before each meal. Another patient is not troubled with the wind till half an hour or longer after food; here the charcoal should be taken soon after the meal. Five or ten grains of charcoal is generally enough, and this dose failing, it seldom happens that a larger one succeeds, though this should be tried. Some give a teaspoonful or more of powdered charcoal. Supposing charcoal to fail in cases such as those just described, we have other efficient resources in the sulpho-carbolates, and carbolic acid; these, indeed, often succeed when charcoal fails.

[As an antidote to alkaloid and other poisonings the dosage has been given as one half-ounce or more. Animal charcoal, the purified form, is here selected. We should not, however, rely upon this solely, but it may supplement other means.]

At other times profuse formation of wind is accompanied by acidity. Charcoal, administered as just described, will generally obviate both these symptoms; and in like manner sulpho-carbolates and carbolic acid, although less successful than when acidity is absent, will often prevent the production of both wind and acidity.

Some persons after meals are troubled with a little wind, acidity, and a sensation of weight at the pit of the stomach. Charcoal will relieve these cases, but nux vomica, in five-minim dose (of the tincture), taken a few minutes before meals, is to be preferred.

In the treatment of flatulence it must never be forgotten to direct the patient, as far as possible, to abstain from those kinds of food which are prone to fermentation. Sugar and starchy foods must be avoided or taken sparingly, and thin, well-browned toast, on account of the carbonization of its surface, may be substituted for bread. The meals should be very moderate, the food well masticated, and drinking postponed till the meal is nearly finished, or, still better, till an hour after its completion. Tea is very obnoxious to flatulent patients.

Most of the charcoal passes away with the fæces, though a little, it is stated, finds its way into the blood and lymphatics. It has been used for the purpose of checking intestinal flatulence, but it is seldom now used thus.

Wood is preferable to animal charcoal for internal use, except as an antidote in poisonings. It is often advantageously mixed with an equal quantity of bismuth, when flatulence is combined with acidity and pain.

Charcoal is more active in the form of powder than when made up into lozenges or biscuits. It is generally administered well mixed up in a wineglassful or less of water, but it may be given in wafer paper or in cachet; bismuth may be mixed with it in either form of administration.

On theoretical grounds, Rossbach and others have wished to exclude this substance as useless, but it is undoubtedly a useful drug, though its indications are limited and its mode of action obscure.

CARBONIC ACID

It is asserted that this gas applied to the eye relieves the pain and photophobia of scrofulous ophthalmia, and that injected into the vagina it eases the pain of ulceration of the os uteri and of cancer and neuralgia of the uterus. According to Sir J. Simpson, the inhalation of this gas is serviceable in chronic bronchitis, asthma, and irritable cough.

Carbonic acid gas is generally employed dissolved in water. Natural waters containing a large quantity of carbonic acid are used externally in chronic gout, chronic rheumatism, and many chronic affections. Carbonic acid is an excitant of the skin, producing redness, tingling, a sensation of warmth, and an increased flow of perspiration; after a time the gas acts in some measure as an anæsthetic, lessening the sensibility of the skin, and removing or diminishing pain.

It is held that the stimulating powers of the Nauheim waters in the treatment of heart failure depend largely upon their highly carbonated character. (*Vide* Nauheim-Schott Treatment.)

Carbonic acid water is employed in painful and irritable conditions of the stomach. It eases pain, and checks vomiting. It is an excellent addition to milk, which, after the admixture, is generally retained, though previously it may have been rejected.

Lime-water and milk may be profitably substituted for milk and carbonic acid water in diarrhœa with irritability of the stomach, but in cases of constipation carbonic acid water and milk are much to be preferred.

The special value of Koumiss (fermented milk) in the treatment of irritable states of the stomach depends in part upon its highly effervescent (carbonated) condition.

SULPHUR

SULPHUR dusted on the skin produces no effect, but mixed with lard, or other unctuous substances, and rubbed in, it excites a slight degree of irritation; hence sulphur ointment has been used to stimulate indolent sores to a healthier condition; for such purpose, however, more efficient agents have superseded sulphur ointment, the use of which is now almost entirely restricted to the cure of itch. The object here is to destroy the insect (*acarus scabiei*) and its ova, on the presence of which the disease "itch" depends. A knowledge of the habits of the acarus suggests the means best calculated to effect this purpose. The female as soon as impregnated burrows obliquely under the skin, and day by day deposits her eggs till she dies. The male remains a wanderer on the surface, and is easily attacked and killed by the ointment. To reach and destroy a female and her eggs it is necessary to break up the burrows wherein these lie concealed, and to lay them bare to the action of the sulphur. The destruction of the burrows is easily effected by the liberal use of soap and water, which removes the superficial and dead cuticle, and exposes the creature and its ova.

Various methods of sulphur treatment are in use, but it will be sufficient here to record a few only.

M. Hardy claims that his method will cure in four hours. He first subjects the body for half an hour to a friction of soft soap, to cleanse the skin and lay bare the burrows. Then follows a warm bath of an hour's duration, during which the skin is well rubbed, to complete the destruction of the burrows. Then the skin is well rubbed all over—except the head and face, saving the rare instances when these parts

attacked—with an ointment composed of two parts of sulphur,
of carbonate of potash, and eight of lard. This rather severe
hod not infrequently irritates and chaps the skin, and it is, there-
, inadvisable for delicate skins, especially if much eczema or
mmation is present, affections which this vigorous treatment would
oubtedly much aggravate.

is often sufficient to treat vigorously those parts only of the body
re the rash is most apparent, and to apply the ointment to other
s in a milder manner.

the skin is delicate, much irritated, or inflamed, a mild soap may
ubstituted for soft soap, and an ointment, without alkali and with
sulphur, for the one above mentioned; at the same time the
ation of the applications would be shortened, and instead of one
tinuous severe application, several washings and inunctions would
place on successive nights. The ointment should be left on all
ht.

he simple ointment of the Pharmacopœia, little irritating to the
, containing no potash or other alkali, is in most instances suffi-
t to cure itch in three days. The patient should be directed to
a nightly warm bath, and to rub the skin with soap, bland or
ng, according to the condition of the skin. After wiping the body
oughly dry, the ointment is to be well applied to the skin by the
ide, just before bedtime, and to be washed off on the following
ning. R. Liveing recommends a weaker ointment than that of the
. He orders one drachm of sulphur to the ounce, *i.e.* just
t half the pharmacopœial strength. This ointment may be applied
very part of the body, except the face and scalp, for 3 or 4 nights
uccession, then nightly, for 7–10 days, to the parts most affected.
he irritation set up by the parasite and its eggs excites sometimes
e or less eczema and impetigo. Now the treatment adapted to cure
itch will certainly tend to aggravate these accompanying eruptions.
void such a complication, Hebra recommends a milder ointment of
fferent composition: namely, chalk, 4 oz.; sulphur and prepared tar,
ch 6 oz.; common soap and lard, of each a pound; the various con-
ents in this preparation serve distinct purposes. The chalk helps
hanically to remove the dead cuticle and to break up the burrows;
tar serves the twofold purpose of diluting the sulphur and of acting
eficially on the eczema, while the soap and lard further effect the
tion of the sulphur; the soap, further, by virtue of its alkali,
ks the weeping from the red, raw, eczematous eruption. This
ment, accompanied by the use of the warm bath, is employed twice
y, and cures completely in three days. As to sulphur strength, it
little more than half the B.P. strength.

fter the itch is cured, it often happens that the mildest ointments
te and increase the eczema and other eruptions which had been
uced by the scabies; hence it is inadvisable to continue the use of

such unguents for many days. On withholding the treatment the rashes produced by the scabies will frequently disappear at once. After the course the patient must put on an entire change of linen, and the soiled clothes must either be boiled in water, or heated in an oven, to a temperature above 212° Fah., in order to destroy the insects and the ova that may be concealed in the linen.

Some maintain that the sulphur of the ointment plays no part in the destruction of the parasites, but that the fatty matters, by obstructing their breathing pores, suffocate and so destroy them. This opinion seems to be erroneous, a sulphur ointment being far more effectual than an ointment of simple fat. Sulphuretted hydrogen is very destructive to vegetable and animal life, and it is probable that this gas is the efficient agent in the destruction of the developed itch insect; the sulphuretted hydrogen is formed by conversion from the sulphur.

Except in rare cases, the ointment need not be applied to the head and face, for in this country these parts are not often affected. The disagreeable odour of the ointment may be, in part, concealed by the addition of otto of roses or other fragrant substance.

To avoid the disagreeable odour and irritating effect of the sulphur, many dermatologists substitute storax, which is said to be just as effectual. Practically, however, the cure for itch is sulphur in some form or other. (*See* Sulphides.)

The complexion of young women in whom the menstrual flow is disordered, is sometimes spoiled by numerous small elevations or pimples, scarcely or not at all reddened; sometimes a minute pustule forms on the summit of one or other of the elevations; the skin at the same time loses its healthy transparency. This is perhaps a form of acne, though unlike that commonly seen. Sometimes the eruption appears independently of menstrual disturbances, and, indeed, it may almost vanish at the menstrual period, to recur when this has ceased. This eruption may last months, or even years, greatly to the patient's annoyance. It will, however, generally yield to the application, twice or three times daily, of the following lotion:—Sulphur, a drachm; glycerine, an ounce; rose-water, half a pint. This lotion speedily benefits the eruption, even when for years it has remained uninfluenced by other treatment. Typical acne may be treated in the same way.

An ointment composed of two drachms of hypochlorite of sulphur and an ounce of simple ointment, and the official iodide of sulphur ointment, are both very useful in the severer forms of acne. They should be applied twice daily. Where acne indurata is accompanied by much acne punctata, frequent washing with plenty of soap and warm water will assist the action of these applications. The iodide of sulphur ointment is of especial value in this affection, but according to Whitla it needs very careful trituration during preparation, for if any gritty particles of the iodide are present they will cause much irritation.

The effect of these ointments, and to a lesser degree of the plain sulphur ointment, is very striking upon acne indurata. In its earliest stage the little hard knot, just felt, is quickly dissipated by the inunction, and may quite disappear with two or three applications on successive nights. Should the nodule have advanced further and have suppurated, the ointment then hastens maturation, and promotes the subsidence of the surrounding induration, materially curtailing the process. The ointment also appears to prevent fresh developments in the parts around if smeared on wide of the actual disease.

In acne rosacea, the ointment smeared over the nose and neighbouring parts, yields striking results, the hardened, swollen tissues returning to a more normal state.

The iodide of sulphur ointment is useful likewise in bromic acne.

In these several forms of acne, the ointment should be smeared on thickly night and morning.

In genuine prurigo Dr. Anderson applies night and morning an ointment composed of an ounce of sulphur, six drachms of liquid tar, and four ounces of benzoated lard.

Being quite insoluble in any of the fluids of the mouth, sulphur possesses no taste; but as it often contains a small quantity of either sulphurous acid or of a sulphide, it may partake of the flavour of these substances. It undergoes no change in the stomach, and in no way affects the mucous membrane of this organ.

In the intestines, however, the case is otherwise. Here in ordinary doses sulphur causes rumbling, slight colicky pains, followed in a short time by a softened evacuation, sometimes to be repeated soon. From the occurrence of colic, and the semi-solid condition of the motions, it is generally held that the sulphur acts only slightly on the mucous membrane, and purges chiefly by exciting contractions of the muscular coat of the intestines. From the mildness of its operation it is ranked among the laxatives. The precipitated sulphur, being more finely divided than the sublimed, acts more surely and effectually as a purgative, though some have taught that the sublimed sulphur, owing to its grittiness, irritates the bowel mechanically, and to this extent possesses an advantage.

The too prolonged use of sulphur excites a catarrhal state of the mucous membranes, and impairs digestion.

Sulphur is a useful purgative in piles and fissures of the anus, where it is needful to maintain the motions in a soft and yielding state, so that the passage may not be irritated by hard, difficult stools. It is also employed, and for a similar reason, in stricture of the rectum. In habitual or obstinate constipation it often succeeds after the failure of other remedies. The compound liquorice powder of the German Codex now introduced into the B.P., or the following formula, ten grains of sulphur mixed with a drachm of confection of senna, these are convenient preparations. Compound liquorice powder contains both sulphur and senna, and is not disagreeable. Dr. George Bird states that children like it, and that for them it is an excellent purgative; its usefulness, indeed, both for children and adults may be now regarded as thoroughly established. The dose for adults is one to two teaspoonfuls stirred into a little water or milk. Apart from its softening effect on the motions, sulphur exerts a beneficial action on the rectum, both in prolapsus and in piles. In piles one or other of these formulas is advantageously given as a *morning* dose.

What changes does sulphur undergo in the body, and in what way does this drug act as a purgative?

It has been suggested that some of the sulphur becomes dissolved in the fatty substances it meets with in the intestines, and thus blended, is in a fit condition both to act as a purgative, and to pass into the blood; but the fact that when sulphur is administered simultaneously with much fat, there is no increase in the quantity of sulphur in the urine, renders this explanation improbable.

Some of the sulphur, undoubtedly, is converted into sulphide in the intestine, for after the ingestion of sulphur the gas generated in the intestines contains not only a considerable quantity of sulphuretted hydrogen, but this gas is actually given off by the skin, to the extent even of tarnishing metal articles worn about the person. Sulphur acts probably as a purgative through this conversion into a sulphide, and it is by virtue of this same change that it is enabled to enter the blood, a view supported by the fact that sulphides act in the same way as sulphur. Yet a portion probably passes through the walls of the intestines, in the form of fine particles, undissolved; the quantity so conveyed will, undoubtedly, be very small. The intestinal conversion of sulphur into sulphide is credited, to a great extent, to the alkaline bile; but it must be remembered that the same change appears to take place when sulphur is applied externally, and hence that contact with the living tissues is apparently sufficient to effect the change.

The action of sulphur on the physical or chemical constitution of the blood is at present unknown.

It is supposed to act on certain secretions, and has been said to produce salivation, occasionally, in persons who have previously taken mercury. It is also generally held that it excites an increased secretion from the mucous membrane of the air-passages of healthy persons, although this is denied by Buchheim. Graves and other authorities strongly recommend sulphur in doses of from five to ten grains, repeated three or four times a day in severe chronic bronchitis, with abundant discharge, especially when accompained by constitutional debility. It is said to lessen the secretion, and to render its expulsion easier.[1] It is also said to promote the flow of perspiration.

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[1] Whitla praises very highly the use of the onion, a vegetable containing sulphur, in the treatment of respiratory affections. He recommends th

ur is stated to increase both the frequency and force of the
ontractions, but these several assertions greatly need confir-

ommonly supposed that the application of sulphur to the skin
ve the pain of chronic rheumatism and sciatica; but, as in
; the sulphur, it is generally recommended also to envelop the
limbs in soft flannel, it is difficult to determine whether the
attributable to the sulphur or to the flannel. Administered
y, sulphur is useful in chronic rheumatism of the joints, and
lar rheumatism.
aid that the internal administration of sulphur is serviceable
ic eruptions of the skin, such as acne, psoriasis, impetigo, and

ur has been recommended as an insufflation to be blown on to
sed surface in diphtheria—and apparently with some benefit.
local use, but we possess other much more efficient remedies
isease.
f the sulphur taken into the stomach escapes with the fæces;
portion which enters the blood, some becomes oxidized and
in the urine as sulphate, or one of the lower oxides of sulphur.
great volatility, the sulphuretted hydrogen formed in the
d absorbed into the blood escapes in some measure by the
d skin, and occasionally with other secretions, such as the
l the urine.
tion of the ingested sulphur is said to pass through the
and to be separated by the kidneys in the uncombined state.
produces no change in the quantity of the constituents of
e, with the exception of the sulphur compounds, which it
s.
ur may be conveniently administered in milk; a bone spoon
e used to mix it with the milk.

SULPHIDES OF POTASSIUM, SODIUM, AMMONIUM, AND CALCIUM

atural waters contain one or more of these substances. Sul-
waters are found at Harrogate, Strathpeffer, Barèges, Bag-
Luchon, Aix-la-Chapelle, etc. They have a characteristic
ke that of rotten eggs.
hree first sulphides are freely soluble in water, the last very
so.
uretted hydrogen and sulphides possess the same action, and

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onion, "boiled for one or two hours and eaten freely at bedtime," as
purgative and decided expectorant.

sulphides generally owe their virtues to the sulphur and not to the base.

Sulphuretted hydrogen is very poisonous both to animal and vegetable life. After absorption it decomposes the blood, first reducing and then decomposing the hæmoglobin: hence it produces asphyxia. It also poisons the tissues, paralyzing the nervous and muscular tissues.

Strong solutions of these soluble salts excite active inflammation of the skin; weaker solutions stimulate the skin, augmenting its supply of blood, and increasing perspiration.

Baths containing these substances are very useful in the chronic forms of some skin diseases, such as psoriasis, eczema, and lichen; likewise in chronic rheumatism, chronic gout, and chronic lead-poisoning. In these affections the natural sulphurous waters are used largely as baths; in eczema and psoriasis care must be taken not to employ them till the subsidence of the acute stage, otherwise they may greatly aggravate the rash. Obstinate forms of these skin diseases, rebellious to other treatment, often yield to sulphide baths.

It has been attempted to explain the efficacy of sulphurous baths in cases of chronic lead-poisoning, upon the assumption that they eliminate the lead with the sweat. During the use of these baths the skin, it is said, becomes covered with innumerable black points of sulphide of lead; in point of fact the lead thus blackened has been shown in certain cases to have been deposited upon the skin from external sources, and not to have been eliminated with the perspiration. This objection, however, has been met by the assertion that if a lead-poisoned patient abstain carefully from all contact with lead, yet, as often as he uses a sulphurous bath, his body will still become blackened as above described. On theoretical grounds it is hard to understand how this metal can be eliminated with the perspiration, but admitting the possibility, the metal would, no doubt, at once suffer precipitation on the surface of the body as black sulphide. For the further consideration of this point we must refer our readers to the section on lead.

The use of these baths at a very high temperature will often restore a considerable degree of suppleness to joints distorted and stiffened by chronic rheumatoid arthritis. Yet as other baths of like temperature appear to do equal good, it is difficult to say whether the sulphides play any part in the beneficial results, although, it is true, there is a widespread, and perhaps well-grounded, belief in their efficacy.

The sulphides may be employed to cure itch, etc., and a very efficient application is made in the following way:—Boil one part of quicklime with two of sublimed sulphur in ten parts of water, until the sulphur and lime combine; let the solution stand, and afterwards decant the clear part: in this process metal vessels should not be used. After the patient has bathed and dried himself, the liquid solution so obtained is to be painted over the body. This application is rather irritating, and sometimes produces a roughness of the skin, which may continue for some time. Dr. Bourguignon, who introduced this plan, claims that it will cure in half an hour. This closely resembles what is known as Vlemingkx solution, the formula for which Dr. Whitla gives thus:—Two ounces of powdered sulphur, one to two ounces of slaked lime, water half a gallon, boil, let stand and decant. This solution is to be lightly brushed or sponged over the parts affected. No previous scrubbing or soaping of the body is necessary. Dr. Whitla speaks most highly of this treatment. He recommends several applications to ensure complete destruction of the parasites; in his practice this method has quite superseded the sulphur ointment. If there be much irritation of the skin to start with, the solution may prove too irritant. (See *Sulphur.*)

The sulphides are in part decomposed by the acids they encounter in the stomach, giving rise to disagreeable eructations of sulphuretted hydrogen gas.

The sulphides in small doses excite a sensation of warmth at the epigastrium, but in excessive doses they produce active inflammation of the digestive canal, with the customary symptoms of such.

Small doses act as a slight irritant to the intestines, and determine gentle relaxation of the bowels. It is supposed, as previously stated, that sulphur acts as a purgative, by its conversion into a sulphide through the agency of the alkali of the bile or otherwise.

In cases of poisoning by certain metallic salts the sulphides may be employed, inasmuch as they precipitate the metal in the form of an insoluble sulphide, and so render it harmless. There is danger, however, of giving a soluble sulphide in too large quantity, since, in its turn, it would itself excite inflammation of the alimentary tract; wherefore sulphide of iron is preferable to the alkaline sulphides. If, however, the metallic poison happened to be in acid solution, the sulphide of iron, even, would not be a satisfactory antidote, for there would be an abundant evolution of hydric sulphide.

The effect of the sulphides on the blood, *i.e.* of the sulphides as such, after absorption into that fluid is at present unascertained. The problem is not easy of solution, for it is impossible to dissociate the effect of the sulphides from that of sulphuretted hydrogen which will always be evolved more or less from the former.

Persons habitually breathing air impregnated with sulphuretted hydrogen are prone to suffer from marked anæmia; the gas appears also to cause much functional depression.

Sulphides affect chiefly the mucous membranes and the skin. Given in the form of natural waters, they are highly efficacious in chronic catarrh of the pharynx and of the respiratory tract. They are especially useful in follicular pharyngitis, and are much resorted to abroad by public singers. Some observers find these waters ver useful in phthisis, even in the febrile form, but the high altitud where these waters are generally taken exerts doubtless some, perha the chief, beneficial effect. Many of these sulphur waters are obtai able in this country, but, prescribed in the usual way, sulphid probably act as well. I have tried sulphide of calcium, pushed to full limit of toleration in phthisis, but without any apparent good.

After extensive trials, Dr. Bergeon, of Lyons, strongly recommen intestinal injections of sulphuretted hydrogen in the treatment consumption. The practice, however, has been so entirely abandon that a detailed description is scarcely called for. His treatment said to lessen cough and expectoration, and to abate the fever, w other consequent good results. It was also said to be of valu chronic bronchitis and asthma. Dr. H. C. Wood regards Berge method as barbarous, but he considers that the sulphides in the f of the sulphur waters or of a solution of hydric sulphide have excellent effect upon catarrhal processes generally, and speciall the catarrhs of phthisis, chronic bronchitis, and asthma.

These substances often yield striking results, in certain troubles diseases, *e.g.*, they influence the suppurative process in a very dec and manifest manner, as may be exemplified in the common case sore, discharging a thin, watery, unhealthy ichor. Under the i ence of the sulphides the discharge will speedily undergo a hea change, becoming at first more abundant, afterwards diminishing, throughout continuing creamier, thicker, and healthier, with all characters indeed of "laudable" pus.

The sulphides appear to me also to possess the property of prev ing and arresting suppuration. Thus in inflammation threatenin end in suppuration they reduce the inflammation, and avert formation of pus. This effect, for instance, is manifested by local application of sulphur compounds in acne indurata, a subje be dealt with more in detail further on.

After the formation of pus, in the case of boils and abscesses, influence of this group on the suppurative process is still more spicuous; the sulphides now hasten maturation considerably, w at the same time they diminish and circumscribe the inflamma and promote the passage of the pus to the surface, and its evacua Their efficacy may be frequently demonstrated in cases of the fol ing kind:—An unhealthy child, from six to twelve months old, in course perhaps of measles or scarlatina, is the subject of a slight throat, which produces behind the angle of the jaw conside enlargement of the glands, and a swelling, of stony hardness, enough maybe to interfere with swallowing, and even to push head on one side. Very deep-seated suppuration takes place in glands, but for a long time there is neither redness of the skin fluctuation, the pus very slowly making its way to the surfac at a fortnight, three weeks, or even a month may elapse before the scess bursts, or is fit to be opened, and when this is done a deep le is left, with considerable induration around it. So great are the in and constitutional disturbance in affections of the kind, that the ild will sometimes die, and even if this fatality be averted, the deep scharging hole will heal very slowly, owing to the indurated and healthy state of the adjacent tissues. Now, in such a test case, if e give a tenth of a grain of sulphide of calcium, mixed with a grain sugar of milk, every hour or two, the results are most striking. e pain and constitutional disturbance begin to diminish, the swell-g becomes smaller, the pus reaches the surface in four or five days, ving when it is evacuated a benign wound, which heals quickly. e effects of these remedies are equally conspicuous in mammary scesses, although, in rare instances, they appear temporarily to in-ease the pain—a fact which seems sometimes to hold good for boils: a rule the pain is speedily mitigated. Strange to say, I have nd these remedies much less useful in forwarding the maturation d expulsion of pus in indolent buboes, but in such cases my experi-e of the sulphides has been small.

It may be urged that it is difficult to imagine how these remedies n produce effects so different and apparently opposite as the disper-n of inflammation with arrest of suppuration in one case, and the turation and expulsion of pus in another; poultices, however, and fomentations are able both to subdue inflammation and prevent ppuration, and to mature and hasten the evacuation of pus, accord-g to the stage of the inflammation.[1]

In like manner in boils and carbuncles these remedies yield excellent ults. A tenth of a grain of sulphide of calcium given hourly, or a arter or half a grain three or four times a day, will generally pre-nt the formation of fresh boils, while it lessens the inflammation and uces the area of existing boils; at the same time it liquefies the e, which separates much more speedily, thus curtailing consider-y the course of the boil. When the skin has not yet broken, and slow-separating core is not yet exposed, the sulphides often con-t the boil into an abscess, whence on bursting pus is freely dis-rged, and the wound at once heals. If the centre of the hardened ollen tissues is not yet dead, the pustule may dry up, the inflam-tion subside, and a hard knot be left, which disappears in a few ys without the formation of a core, and without any discharge. ese remedies, meanwhile, improve the general health, removing t debility and *malaise* ordinarily so markedly associated with ls and carbuncles. In some cases, however, as in the deep-seated ls and abscesses of diabetes, they are less efficacious. In carbuncles sulphides will generally be found equally serviceable, melting, as it were, the core into healthy pus, and so expelling quickly the dead and otherwise slow-separating tissues.

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[1] Compare also the action of sulphur applications in the treatment of e in its several stages.

As to local treatment, belladonna applied over abscesses and carbuncles reduces inflammation and allays pain. The skin should therefore be smeared thickly with a mixture of equal parts of belladonna and of glycerine, and over this a poultice should be applied and the smearing renewed each time the poultice is changed. A poultice, however, being liable to bring out a fresh crop of boils in the parts which it covers, it is well to smear on belladonna ointment for some distance around but not over the boil, and then to apply a poultice; the greasy application protects thus the neighbouring tissues. Better still, we may protect the parts around by a belladonna or opium plaster spread on leather, with a hole in the centre the size of the boil, and then smear glycerine and belladonna on the boil itself, covering all with a small poultice. The leather plaster efficiently protects the surrounding skin, and averts the production of fresh boils. I have thought it worth while to point out these useful accessory plans of local treatment, but it is scarcely necessary to observe that whilst investigating the effects of sulphides I have employed these alone, at most sometimes applying a poultice. Indeed, the effect of sulphides on boils is so excellent and prompt that external applications are generally unnecessary, except in the case of carbuncles, where local measures are required. Sulphides should be continued till the discharge has nearly ceased, and till stimulating applications are needed, at which time tonics must replace the sulphides.[1]

The good effects of sulphides are conspicuous in certain scrofulous sores not uncommonly seen in children. Scrofulous children during the first few months are sometimes subject to indolent abscesses in the cellular tissue which run a very slow course. At first only small, hard nodules are discoverable, these may be no larger than a pea, are easily felt through the skin, which is of a natural colour, and is freely movable over them. The small nodules next suppurate and gradually enlarging, the skin becomes adherent and altered in colour to a red or even violet hue, at the same time the smaller vessels in the neighbourhood may become enlarged and even varicose. The tumours may attain the size of a florin, and when matured feel soft and boggy. After a time a small circular opening appears, not larger, perhaps, than a pin's head, through which there escapes a thin unhealthy pus. If deep-seated, as, *e.g.*, in the buttocks, or if they occur in fat children, the tumours may cause very little or no discoloration of the skin. The chief noticeable feature, then, is the small sharply-cut opening, just as if a piece had been punched out of the skin. These formations follow one another, and may continue to distress the child for months

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[1] In the treatment of boils and of acne, Whitla speaks most highly of the value of onions as an article of diet. This is of course to some extent a sulphur treatment. See foot-note, p. 120, Sulphur.

n mild cases a few only may form, whilst in severe cases
e at one time ten or a dozen in different stages of develop-
en they heal they leave a white, sharply-defined, but not
essed scar. Now this troublesome and obstinate affection
ay speedily to the administration every hour or two of a
entieth of a grain of sulphide of calcium. The formation
ules is at once checked, for a fresh one now rarely makes
nce, although for months or years the child may have
m successive crops; many of the abscesses, especially in a
stage of development, dry up and disperse; others speedily
r contents, the thin and unhealthy pus becoming creamy
ble"; lastly the abscesses already in an open state im-
us becoming healthier, and the wounds healing quickly.
cases, in addition to these subcutaneous formations, the
ise become affected. The phalangeal bones of the hand
equently attacked, though, not uncommonly, the meta-
r, more rarely the metatarsal. Where the phalangeal
ffected, one or several of the fingers become nodose. For
ile the skin remains pale and freely movable over the
hen suppuration ensues, the swelling increases, the skin
l and painful, and after a time the integuments slowly
e point, feeling boggy on palpation; this lasts for a con-
riod before the abscess opens naturally. Then, generally,
e separates, or in bad cases the whole of the shaft comes
ng the epiphyses behind. When an opportunity occurs to
ese bones before suppuration sets in, the shaft is found
y enlarged, very pale, and the cancellous structure infil-
a straw-coloured firm substance, whilst the epiphyses
cartilages are healthy. Even in these severe cases the
ill benefit considerably; thus, before suppuration has set
t it has made but little way, they are often able to remove
g, though, to effect this, large doses may be required.
suppuration has taken place the good effects of sulphides
great measure, on the amount of disease of the bone. If
haft has become necrosed, of course, the sore will not heal
e has been got rid of, but suppuration often occurs, whilst
little, or perhaps none, of the bone has become dead. In
e the sulphides will hasten the expulsion of the pus, or
skin be already broken they will improve the character of
and the discharge, and heal the sore, leaving in the end
scar adherent to the bone: the finger will now slowly
natural proportions. The sulphides affect similarly large
scesses on the backs of the hands or of the feet. Whilst
encing locally strumous formations and abscesses these
nprove the child's health, which perhaps had failed before,
cod-liver oil and steel wine. That the improvement is due

to the sulphide is shown by the fact that the amendment occurs when this drug alone is administered. On prematurely discontinuing the sulphides fresh formations are apt to appear, especially on the occurrence of even a slight illness; a severe illness, indeed, will often excite a few fresh abscesses, in spite of the sulphides. Sometimes, instead of improving the general health, sulphides produce marked anæmia. I think this is due to the administration of too large a dose.

In suppurating scrofulous glands of the neck the sulphides appear to me to exercise a very beneficial influence by hastening the elimination of the pus, and subsequently, of the cheesy scrofulous matter. Or again when the abscesses have burst, and continue to discharge slowly a scanty, unhealthy pus, and when the edges of the sores have become much thickened and indurated, the sulphides will render the discharge more abundant, thick, creamy, and healthy, they will considerably hasten the evacuation of the scrofulous matter which prevents the healing of the wound, and at the same time they will soften the round indurated edges, so that the sores heal much more speedily. If small doses appear to affect these sores inadequately, larger doses, such as half a grain or a grain, should be given several times a day, or even every two hours. I need hardly say that to compass the results described the treatment must be continued several weeks, for when the sores have been discharging perhaps for months or even years, it is vain to expect much amendment in a few days.

To adults sulphide of calcium is best administered in coated pill form, in quarter or half grain dose, three or four times a day. For children I use the following formulæ:—Mix a grain of the sulphide of calcium (the member of this group which I always employ) with half a pint of water, and give one teaspoonful hourly. It is essential that the medicine in this form should be compounded daily, since the salt becomes rapidly oxidized and changed into a sulphate, and in a very short time none of the sulphide remains. It is therefore still more convenient to give the sulphide in powder. A child should take one-tenth or one-twentieth of a grain as a dose, the powder being put upon the tongue and washed down with a draught of water; lastly, should the child be able to take pills, a tenth of a grain, made into a small varnished pill, should be taken hourly.

Scrofulous affections have been shown to be, to a large extent, if not entirely, tuberculous in their nature. On this account the advisability of operating must be had in mind, and each case treated on its own merits. On the ground of the tuberculous nature of these local inflammations, it has been suggested that we should aim at an outward discharge of the peccant material rather than at absorption and dispersion. It must, however, be remembered that absorption and dispersion can only take place after the *local triumph* of the tissues er the poison present. It would be with this object in view that e sulphide would be given.

In employing these agents in baths, porcelain or wooden vessels ust be used, as the sulphide attacks and discolours most metals. hese baths emit a powerful odour, very offensive to some people.

The sulphide of calcium here referred to is the Calx Sulphurata of he B.P. It is a mixture, not a pure chemical. It should contain, owever, not less than 50 per cent. of pure sulphide of lime.

CHLORINE GAS
CHLORINE WATER
$\left.\begin{array}{l}\text{CHLORINATED SODA}\\ \text{CHLORINATED LIME}\end{array}\right\}$ and their solutions

THESE substances are used as disinfectants, antiseptics and deodorizers.

This action depends in part on their power to destroy the organisms that produce putrefaction and septic states of the body generally, including in this group the specific fevers.

Whatever power they possess in these respects is due either to chlorine or to hypochlorous acid.

Chlorine gas, possessing very strong chemical affinities, acts probably by seizing with avidity upon the hydrogen of organic and inorganic substances, thus breaking up their composition.

Hypochlorous acid, which is given off abundantly by the two last-mentioned members of the above group and which is formed whenever free chlorine comes in contact with moisture, is an active oxidizing agent. It is a very unstable body, yielding up its oxygen readily, and is hence as an oxidizant destructive to many substances.

These substances are employed in sick-rooms as *disinfectants*, but the evidence in favour of their possessing such a property, in such degree of dilution or concentration that the air is still respirable, is more than inconclusive.

Many infecting matters, it is true, when treated with these substances, lose their power to propagate disease, but in general it is impossible to subject objects, and particularly persons, to such a concentrated action as is found to be required in these experiments. It is uncertain, then, whether, in the gaseous form, or rather in that diluted state in which it can be borne, chlorine can destroy germs and their spores.

Chlorine as a *deodorizer* acts in two ways: on the one hand it destroys the germs which produce putrefaction, on the other it destroys the noxious gases produced by decomposition, such as the ammonias, sulphuretted hydrogen, and sulphide of ammonium, which create the disagreeable odours of sick-rooms.

Owing to its gaseous state, and therefore power of diffusion through the air, chlorine is admirably suited as a deodorizer; it is thus enabled to penetrate into every cranny of the room, and destroy noxious and offensive gases.

While these substances may be conveniently and profitably used as deodorizers, it must always be borne in mind that it is better to prevent bad smells by free ventilation, and that chlorine gas itself has an odour very disagreeable to most people. If these deodorizers are often required in a sick-room, it is a sure sign that ventilation is defective, and probably that the nurse is careless.

To disinfect *unoccupied* rooms the air must be very strongly impregnated with chlorine to the extent of producing one volume o chlorine for every hundred volumes of air. Koch recommends chlorin as decidedly more efficient than sulphurous acid if used in sufficien concentration; but for this purpose it is necessary to take not less tha 15½ lbs. of chlorinated lime and 22 lbs. of hydrochloric acid for ever 1,000 cubic feet of air. The room should be first sealed as carefull as possible, windows, chimney, etc., and then the gas liberated an the door quickly closed on the escaping disinfector. The tota quantity of the disinfectant should be distributed about the room an in each case placed *as high as possible* because of the heaviness of th gas; it would else form a heavy layer at the bottom of the room an never reach the upper parts in concentration. The room must be ke closed for 24 hours, then ventilated freely. The objection to th method is that by it all sorts of materials are seriously damaged.

Locally, the chlorine group is useful as washes or injections prevent the decomposition of the pus of sores, or of abscess caviti Sloughing, foul-smelling sores should be washed with solutions these or kindred substances. Chlorine compounds, being slight stimulating, improve the condition of indolent sores. After an ope tion, the pus, which sometimes collects in the hollows left in the tissu becomes corrupt, and gives off fœtid gases, which become absorbed a poison the system. This may be avoided by washing out the cavit several times daily with a weak chlorine solution. In puerperal pe tonitis, or at any time when the uterus contains decomposing matt the vagina must be thoroughly and frequently washed out, some d dorizing and antiseptic substance being mixed with the water. puerperal fever and other conditions many obstetricians wash out this way the cavity of the womb itself.

In sloughing of the throat, as in scarlet fever or diphtheria, and salivation and ulceration of the mouth, antiseptic substances v remove the foul odour and tend to arrest putrefaction.

A solution of chlorinated soda has been highly recommended diphtheria quite apart from any sloughing, in the proportion of half drachm of the liquor sodæ chlorinatæ to one ounce of water, but the B.P. solution in full strength may be used without any fear and with the best results.

A similar lotion may be made by mixing one drachm of chlorate of potash with one drachm of strong hydrochloric acid in a bottle, leaving this mixture for ten minutes and adding water gradually and with frequent agitation up to a pint. This solution may be used both as a gargle to the throat and as a lotion to be syringed up the nose.

As a pigment to paint on with a camel-hair brush we may use the liquor sodæ chlorinatæ in one quarter, half, or even in full strength. The old practice of giving chlorine internally has lately been revived by Dr. Burney Yeo in the treatment of typhoid fever. His formula is as follows:—Put into a twelve-ounce bottle 30 grains of chlorate of potash, then add one drachm of strong hydrochloric acid; close the bottle with a cork and agitate till it is full of chlorinous vapours; pour in water little by little, agitating after each addition, till the bottle is half full (the bottle will be corked each time during shaking). Now add of quinine 24–36 grains and fill up with water. Dose, one ounce every one to four hours according to circumstances. The solution may be flavoured with syrup of orange. The quinine here (gr. ij.–iij. in each dose) will add to the antiseptic powers of the liquid. This treatment is still on its trial, though the antiseptic treatment of typhoid fever has not hitherto yielded very striking results.

Diphtheria is sometimes treated internally by chlorine according to a similar formula, viz., ten grains of chlorate of potash and half a drachm of strong hydrochloric acid, mix in a pint bottle, shake, add water little by little, agitating frequently, till the bottle is full. Dose, one or two tablespoonfuls at frequent intervals; sweeten the mixture if need be.

IODINE

Iodine, like chlorine, possesses powerful chemical affinities, and combining energetically with many organic and inorganic substances, is a disinfectant, antiseptic, and deodorizer. Chemically its mode of action is quite similar to that of chlorine—it is, viz., an oxydizant, but in degree of action it is much less energetic.

Iodine being volatile may be used as a deodorizer by simply suspending over the patient's head a lidless chip-box, or a saucer, containing a few grains of the element.

It readily penetrates animal tissues and is applied to the skin for a variety of purposes. A strong solution, such as the liniment, is frequently used as a rubefacient and counter-irritant; it produces at first a sensation of heat and burning, which may increase to an unendurable extent. The inflammation which it excites separates the cuticle to a greater or less extent from the dermis; this may be so slight that in a few days mere desquamation results, but it may rapidly produce a blister containing serum with much fibrin, and sometimes leave a permanent scar—a misadventure which should be carefully avoided.

The skin can generally bear two lightly-painted coats of the Pharmacopœia liniment, unless a previous application has rendered it thin and delicate, in which case one coat, applied lightly, is all that can be endured. If, as sometimes happens, the application causes much pain, the iodine should be washed off with spirits of wine, gin or whisky, eau de Cologne, or, best of all, with a solution of iodide of potassium, and the pain subdued by the application of a poultice. On and around the painted spot iodine liniment will often excite a crop of itching papules, which often appear as late as the third or fourth day after the application.

The liniment is applied to the chest, as a counter-irritant in chronic pleurisy, to promote the absorption of the fluid accumulated in the pleura. Painted under the clavicles in the chronic forms of phthisis, it is of great service in allaying harassing cough, and in checking secretion from the bronchial tubes and cavities of the lungs. Painted over the front and back of the chest it often affords relief in chronic bronchial catarrh, easing the cough and lessening the expectoration. It may be painted on any part of the chest affected with pleurodynia, although a mustard poultice is preferable, as it can be re-applied should the pain return; the iodine, however, may succeed where the mustard fails. Iodine is painted around joints affected with chronic rheumatism or chronic gout, or with chronic synovitis. Like vesicants, it eases the pain, and often removes the fluid distending the cavity of the joint; like vesicants, also, it often causes, for a few days, increased distension of the joint, the good effects not becoming apparent till later. This increase of the swelling may be regarded as an indication of the success of the application. The liniment is useful when painted on the skin over a bronchocele. It should be applied as often as the state of the skin will permit—it can seldom be borne oftener than once a week—until the tumour disappears. The liniment or tincture is recommended as an application to lupus; it should be painted not only on the edges of the sore, but also over the tissues around; it is said to arrest the spreading of the disease. In the form of ointment its applications are manifold. It is of the greatest benefit in chilblains, if well rubbed over the affected part before the skin is broken. The tincture lightly painted over the part is also often used for chilblains, but the ointment is far more efficacious, curing unbroken chilblains in one or two days; in this harassing affection I know of nothing so effective. The intolerable itching of chilblains is often very difficult to relieve: hot water often affords temporary relief, and I have heard patients say that an infusion of celery, used as hot as can be borne, affords far more enduring relief than simple hot water. Of other remedies for chilblains, the compound tincture of benzoin, iodine dissolved in spirit and then mixed with ammonia (colourless tincture of iodine), are both useful.

Iodine ointment is often useful in removing some of the non-inflammatory pains of the chest, but in the treatment of these, since they are not always of the same nature, discrimination must be exercised. When, for instance, the pain is situated in the muscles, and these are tender on pressure, while the skin may be pinched without pain, iodine ointment is indicated; but when the tenderness is situated in the skin, a belladonna preparation is to be preferred. Dr. Hare, I believe, first pointed out this distinction, and it is one which holds true, though not without exceptions.

The ointment, tincture and liniment of iodine are used for the same purposes, but it must be recollected that the ointment and tincture are much milder preparations, and that even after several applications they produce but a small amount of desquamation. When a strong irritant action is needed, the liniment should be employed; a medium effect can be produced by suitably diluting the liniment with spirit, thus we obtain a very convenient strength by mixing together equal parts of the liniment and tincture. For delicate skins and in the case of children the liniment undiluted is not safe as a first application.

The tincture or the ointment is often applied over indurated swollen glands, or parts thickened by chronic inflammation, with the object of promoting absorption of the diseased products; but when the parts are subacutely inflamed, care must be taken, lest the applications increase the inflammation and cause suppuration.

Iodine is a powerful parasiticide, and it is used for this purpose in skin diseases. A mixture of two drachms of iodine with an ounce of light oil of wood tar has been recommended by Mr. Coster as an efficient application in tinea tonsurans. It usually produces no pain, and without doubt prevents the extension of this troublesome disease; it is commonly known as Coster's paste or paint.

In many cases of tinea, even where the disease involves a large part or the whole of the head, this application may be painted over the entire scalp; occasionally, however, the skin is so delicate that this extensive application cannot be borne, and it should then be applied to a smaller surface, and a fresh part painted daily. In exceptional cases it gives so much pain that it cannot be tolerated. Coster's paint, as might be expected, is far more effectual in the circumscribed than in the diffuse form.

The liniment, ointment, or tincture will remove tinea circinata. One application of the liniment is enough, but the ointment or tincture must be applied once or twice daily.

Painting the affected and circumjacent skin with a solution of iodine is strongly recommended to prevent the spread of erysipelas.

Mr. Jordan speaks highly of the application of the liniment in the neighbourhood of and around a local inflammation; thus applied, so as to produce vesication around a bubo, an abscess, or a carbuncle, it considerably reduces the inflammation.

In hydrocele, iodine in solution (generally the tincture) is perhaps the best fluid to inject into the serous cavity surrounding the testicle. The serous fluid must first be drawn off, then the iodine is injected into the serous cavity, adhesive inflammation is excited, and the contiguous surfaces of the sac unite, and the further effusion of serum is rendered impossible.

Iodine solution has been injected into joints affected with white swelling, and into ovarian tumours after tapping, also into large abscesses, after their evacuation, and into the pleural cavity in empyæma.

In the latter case, empyæma, injections may as a rule be dispensed with altogether, if there is free drainage, but occasionally injections, and among these iodine solution, may be called for.[1] White swelling (tuberculous disease of the joint) must be very carefully dealt with, and the question of operation of some sort considered. The injection of iodine is rarely performed now. Ovarian tumours also, since the later developments of ovariotomy, are rarely dealt with now by tappings and injections.

Iodine solutions, injected into the cavities of large abscesses, their contents having been discharged, often prove very serviceable. The tincture freely diluted may be used, *e.g.* tincture of iodine, 2-3 drachms, water, one pint. With such solution the cavities may be well flushed, if drainage alone prove unsatisfactory. Other antiseptics, for instance a solution of Condy's Fluid, would serve the same purpose. Iliac and lumbar abscess may be treated in this way.

Lister's method of treating abscesses and empyæmas has, however, in most cases, rendered the use of chlorine and iodine applications unnecessary.

The hypodermic injection of tincture of iodine, in five to fifteen or more minims up to thirty or sixty, is now much used for the cure of bronchocele; it appears to be of little value in the colloid and fibroid (hard) varieties. Special precautions must be taken to avoid the injection into veins, either of the liquid or of air. (Consult special treatises.) Iodine injections are useful also in hypertrophied tonsils and glandular tumours.' The tincture must be injected into the glandular substance, and not into the connective tissue, or ulceration will ensue. The injections should be repeated once or twice a week.

The tincture of iodine may be used as an inhalation, with signal benefit, in the four following instances :—

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[1] If it be thought advisable to inject an empyæma, the antiseptic solution, whatever its nature, should be very weak, but we repeat that in general injections are best avoided.

1. In the chronic forms of phthisis, when the expectoration is abundant, and the cough troublesome; in these cases an inhalation used night and morning will often lessen the expectoration, and allay the cough.

2. In cases of hoarseness, with hoarse, hollow cough, and some wheezing at the chest, occurring in children, six to ten years of age, who after measles, or independently of it, have been exposed to cold. This affection, involving the larynx, trachea, and larger bronchial tubes, often proves very obstinate, is apt to return, and to persist a considerable time.

3. In some epidemics of diphtheria. The inhalation recommended by Dr. Waring-Curran for these cases consists of 4 grains of iodine, 4 grains of iodide of potassium, 4 drachms of alcohol, and 4 ounces of water; of this a teaspoonful should be added to a pint of water, kept hot by a spirit lamp whilst the steam is inhaled. As the patient becomes accustomed to the iodine, the quantity of the solution may be increased till half an ounce of it is used at each inhalation. It should be repeated many times a day, and each inhalation continued for eight to twelve minutes.

4. In itching of the nose or of the inner canthus of one or both eyes, sneezing, running at the nose of a watery fluid, weeping of the eyes, and severe frontal headache. Patients of various ages are greatly troubled, often for many years, with daily attacks of these symptoms, lasting, it may be, several hours. Iodine inhalation often removes this affection at once, and even when it succeeds only partially it almost always lessens the headache and discharge from the nose. Its effect is most marked upon the itching. (*See* Arsenic.)

I generally adopt the following simple, handy, cleanly, and effectual plan of inhalation:—Heat well a jug, capable of holding about two pints, by rinsing with boiling water, then partially fill with boiling water, into which pour twenty to thirty drops of the tincture of iodine; direct the patient then to put the face over the mouth of the jug, and to breathe the iodized steam, covering both the jug and the head with a towel to prevent the escape of the steam. This inhalation should be used night and morning, for five minutes, or a little longer. Occasionally an excess of iodine will temporarily produce a sensation of soreness in the chest and throat, some redness of the conjunctiva running from the nose, and pain in the head.

In chronic ozœna it is useful to flush the nose with a solution of common salt, of strength one saltspoonful of salt to a tumblerful of water, to which a few drops of tincture of iodine have been added.

The tincture is useful to remove tartar from the teeth, and to stimulate the gums when they begin to recede, leaving the teeth exposed, and more liable to decay. It should be painted over the gums close to the teeth.

An iodine gargle, made with two up to four drachms of the tincture to eight ounces of water, has been recommended to allay mercurial salivation; the tincture of iodine is likewise applied to sores of the throat, syphilitic and simple.

Iodine, in undue quantity, irritates and excites inflammation in the delicate structures of the stomach, inducing pain at the epigastrium, vomiting, diarrhœa, sometimes much collapse, and even death. On account of this irritant action it is generally given, even in therapeutic doses, soon after a meal, when the mucous membrane is protected by the food. Iodine is much less irritating given after a meal, much of it, doubtless, suffering conversion into the comparatively inert iodide of starch; it is, however, doubtful whether in some cases it is not more efficient given before a meal, provided the stomach can tolerate this method.

When iodine reaches the stomach or intestines, and certainly when it enters the blood, theory would suggest that this drug becomes converted either into an iodide of potassium, or, more probably, of sodium, and that thenceforth, in its passage through the body, it will behave as an iodide. Practically, there is much to confirm this view, since the action of iodine on the distant organs of the body is very generally admitted to be identical with that of the iodides; yet some practical authorities state, that in chronic rheumatic arthritis the tincture of iodine is serviceable when the iodide of potassium fails, although it is difficult to understand how this should be. Some of the iodine administered becomes converted into an albuminate.

The question of the mode of action of iodine and iodides is of considerable interest. When free iodine comes in contact with moisture, a compound of iodine corresponding with hypochlorous acid is formed as well as an iodide. Very probably the former is the more active physiologically, and among other properties which it possesses is that of oxidizing. If this be so, then free iodine, should differ from iodides in its action upon the tissues. But it is held by some authorities that when iodides are administered they suffer, in part, decomposition within the tissues with liberation of free iodine, which would then, of course, react as above. According to this latter view, iodides will act in part by conversion into free iodine. Whichever view, however, is held, the similarity of action of iodine, free and combined, must be apparent.

Dr. Anderson recommends iodine in malarial fever. He has treated "upwards of 300 cases with almost invariable success." He gives from twelve to fifteen minims of the tincture. It is said to be not only a cheap but an efficient substitute for quinine, and to cure some cases of ague where quinine has failed.

For internal use the tincture or liquor iodi may be used; the dose of the former is 5–20 minims, the dose of the liquor will be about half this. Trousseau's method of administering the tincture was in solution in sugared water, or in sherry wine according to M. Lasègue's recommendation, the dose to begin at 10 drops of the tincture twice daily, at meal times. Lasègue and after him Trousseau spoke highly of this treatment for rheumatoid arthritis. A very palatable and active iodine wine has recently been introduced by Dr. Nourry and is known by his name.

A FEW INTRODUCTORY REMARKS ON THE RELATIVE EFFECTS OF POTASSIUM AND SODIUM SALTS

In prescribing a medicine it is important to recollect that one element on combining with another element does not necessarily lose its characteristic action, and that we may hence be able to trace its action through a series of salts of which it is a component. Thus we explain the fact that in the laboratory all potassium salts appear to be equally or nearly equally poisonous to the animal body. Of course if the salt has an acid or alkaline reaction it will also act in virtue of its acidity or alkalinity; but from numerous experiments all *neutral* salts of potash would appear to be very close in their poisonous action.

In like manner a series of salts having the same acid radicle may show a similarity of action which we attribute to the acid grouping or element which they have in common. Hence we often prescribe remedies for the acid radicle in one case, and for the basic radicle in another. This is the case with iodides and bromides on the one hand, with mercury and iron salts on the other. Iodides act certainly in most diseases in virtue of the iodine simply, bromides in virtue of the bromine. Hitherto the practice has prevailed of prescribing potassium compounds of iodine and bromine in preference to the corresponding sodium and ammonium salts, but this practice ought certainly to be revised, for potassium salts are far more poisonous than the corresponding sodium salts, without in many cases being more therapeutically active. It is obvious that in those cases where the action sought belongs to the acid half only, we ought to avoid the unnecessary depression arising from the use of potassium salts, replacing them by the corresponding sodium or ammonium salts.

We may now draw attention to the differences between sodium and potassium salts; differences for the most part in degree, but in some particulars in kind likewise.

Potassium salts are highly poisonous to all the animal tissues, suspending the functional activity of the nervous and muscular structures, and probably of all the tissues of the body. On the other hand, the corresponding sodium salts are almost indifferent to the tissues, even when administered in much larger dose than the potassium salts.

This difference between *potassium and sodium* compounds is well exemplified in experiments on the ventricle of the frog's heart. *Small* doses of potassium salts affect its spontaneous contractions, at first greatly reducing their frequency, and then arresting them, at a time when considerable contractility still persists; this last may be made evident by stimulating the ventricle by an induction shock. A *slightly increased* dose of the potassium salt soon suspends contractility as well, *i.e.* the ventricle no longer responds to excitation. Sodium salts, on the other hand, affect spontaneous action very little; indeed, as long as contractility lasts spontaneous action continues. To suspend muscular contractility, sodium salts must be given in dose fourteen to fifteen times larger than the requisite dose of potassium salts.

Again, potassium salts increase considerably the latent period of muscular contraction, whilst sodium salts produce very little effect of the kind.

Potassium salts augment greatly the duration of the period of diminished excitability, but sodium salts only very slightly.

When the ventricle is strongly faradized it is thrown into a tetanic state. Potassium salts in small dose prevent this tetanus, whilst sodium salts, even in much larger dose, lessen it but slightly.

Faradization arrests the spontaneous contractions in a ventricle poisoned by a small quantity of a potassium salt, a quantity, *i.e.*, sufficient to lessen both the force and frequency of the contractions, but insufficient to wholly suspend them; on the contrary, faradization, applied to a ventricle, even when arrested by sodium salt, induces a return of the contractions, one contraction being piled on the top of the other: in this way a considerable total contraction of the ventricle may be produced, and sustained, as in tetanus.

Thus we see that potassium, even when combined and forming neutral salts, still acts as a powerful poison, whilst sodium is so weak in its action that it can hardly be called a poison. From these facts it is obvious that when we seek to profit by the action of the acid element iodine or bromine, and seek this action only, we should give the preparation of sodium preference over that of potassium. Thus far I have based the argument on physiological experiment upon animals, but clinical experience has long taught the same lesson, viz., that potassium salts are throughout far more powerfully depressing, whilst therapeutically they may not be any more active, than sodium salts.[1]

The poisonous action of potassium, sodium, ammonium, and some other salts, depends mainly on the percentage strength, and not on the total amount conveyed to the heart. Thus in experiments on the og's heart, when sufficient of the salt has been added to ting blood to cause arrest of contractility, this can be y diluting the blood with an equal quantity of saline In other words, a given dose, which passed through the arrest its contractions the *percentage strength being high*, rest the heart, even though every grain of the dose pass *if the percentage strength be low.*

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[1] Considerations of a similar kind have of late led to the introduction of the hydrogen salts, hydriodic and hydrobromic acids, to replace the salts of potassium, sodium, ammonium, etc. The question is complicated by the acidity of the former, and their relative value is not yet determined.

cts elucidate the meaning of the experiment of injecting a into the jugular vein, whereby the salt reaches the heart in d strength; such may arrest its action, whilst the same ed at a distance from the heart, so that it becomes freely th blood before reaching that organ, may have little or

ing by such salts it is evident, then, that the treatment sist of free drinking in order to dilute the blood, and that at the same time, endeavour to promote elimination by the d skin. Bleeding, too, should be of some service.

going remarks indicate the great difference in degree, and tent in *kind*, which exists between the salts of potassium a in their action upon the body—and they suggest that he choice lies between a salt of potassium and of sodium choose the latter in every case in which the salt is given ue alone which its *acid element* conveys.

arks upon the poisonous action according to percentage pply probably to a very large number of the salines, so

E OF POTASSIUM, IODIDE OF SODIUM, AND IODIDE OF AMMONIUM

potassium being an extremely soluble salt, endowed with a diffusion power, it finds ready entrance into the blood, and xit from it with the secretions of the body.

ternal application it formerly enjoyed more favour than is it now. As an ointment to the skin over enlarged glands, ration of the epithelium covering these parts, and an augmented flow of saliva. These phenomena, however, are certainly often absent after large doses of the medicine, and even in the presence of severe iodism.[1]

A large dose irritates the stomach and disorders digestion. Some are far more prone than others to be thus affected, so prone, that even minute medicinal doses may act thus.

Like the chloride of sodium and chloride of ammonium, this salt increases the production of mucus by the stomach and intestines, as well as by the mucous membranes of other parts of the body; but in this respect it comes after chloride of ammonium.

Its great diffusion-power enables it to pass with rapidity from the stomach into the blood, and it very speedily appears in the urine, so that only a small proportion of that which is swallowed passes on into the intestines. It purges only when taken in very large doses, and it is never employed for this purpose.

Iodide of potassium acts sometimes as a diuretic.

Some maintain that when iodide of potassium comes in contact with chloride of sodium, either in the stomach or blood, it changes its base, becoming iodide of sodium; but at present we know but little as to this, or what physical or chemical changes it produces in the blood and organs to which it is carried.

If its administration is continued for too long a period, or if the patient manifests great susceptibility to its action, we may produce a condition termed iodism.

Many persons can take this drug in very large quantities, and for an almost indefinite time, without the induction of iodism, while, in the case of others, very small doses, even a grain or part of a grain, are sufficient to produce it. Not infrequently, when the small dose has caused iodism, the symptoms cease on increasing the dose: this phenomenon was pointed out by Brunton.

In iodism the tissues most frequently and most severely influenced are the mucous covering of the eyes and lining of the nose, the frontal sinuses, and mouth, and the skin of the face. Some slight running at the nose is first noticed, along with occasional sneezing, and a little frontal headache; these symptoms grow in intensity, and then the conjunctiva becomes injected, and there is abundant flow of tears. The loose tissues about the orbit become swollen, reddened, and œdematous, and occasionally a peculiar rash appears on the skin of the face, it is at first noticed around the eyes, after which it attacks nd the neighbouring parts, and then the chin. The parts in here stated are most severely affected. The nose is some- .ened, especially at the tip, and is rather swollen. The rash lways present the same appearance. It is often very much hard, shotty, and indurated, but the papules may be broad and covered with what looks like a half-developed vesicle . In some persons iodides produce a petechial rash, affect- t always, the leg exclusively, rarely extending above the more rarely still to the trunk or upper extremities. It st, take several days to produce this rash, but when the disappeared a single dose of five grains may, in three hours, reproduce it. Sometimes on persisting with the medicine rash appears, and the old spots die away, while in other rash endures as long as the medicine is continued. This be the only apparent effect of the iodide, but it is generally ed in variable degree by few or many of the symptoms of The salts of iodine differ with respect to the production of ; thus in many cases the ammonium salt is the most apt to the sodium salt the least liable. Some persons are equally y each of the three iodide preparations. In one case, while nium and potassium salts produced numerous petechiæ, the lt failed to do so, but excited on the arms some erythema m. The petechial rash is often preceded by a sensation of mpanied by some tenderness. These facts seem to disprove ion that either in the intestines or in the blood all iodides become iodide of sodium. The following case is of interest. some years after suffering from white leg, took iodide of on three separate occasions; each time an abundant crop of appeared below the knee of the damaged leg, whilst none on the other leg.

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[1] A patient having told me that he had tried Spirone for asthma, but could not continue it, as it produced in his throat a disagreeable sensation, just like that induced by potassium iodide, and that he was convinced it contained an iodide, I tested it with Mr. Martindale in his laboratory, and we found abundance of iodine. Dr. Paul gave us the following results of his analysis: Glycerine, about 24 per cent.; potassium iodide, about 2 per cent.; acetone, nearly half its volume.

nges in the mouth have already been mentioned. In some odism the stomach is deranged along with the other parts entioned, viz., skin and respiratory passages, although in r's experience the stomach often escapes when the face is on the other hand, the stomach sometimes suffers when the eyes are unaffected. When the stomach is singled out by , there is nausea, and a sensation of sinking at the epigas- h loss of appetite: sometimes the intestines also suffer, and watery diarrhœa. A grain or even less may thus affect the

drug is discontinued, on the occurrence of iodism, the just described disappear speedily, and the rash on the face, ng at the eyes, etc., will greatly decline in the course of ur to forty-eight hours. We may repeat that augmentation e may be followed by a similar decline in the symptoms.

of potassium sometimes produces distressing depression of mind and body, rendering the patient irritable, listless, wretched, and unable to take even moderate exercise without fatigue; there may be perhaps a tendency to fainting. The appetite is generally very bad. These symptoms may arise from a very small dose, and may occur without coryza or irritation of the stomach—a fact important to bear in mind, for, otherwise, the cause of the depression being overlooked, the medicine may be persisted in. On discontinuing the drug, these distressing symptoms disappear in one or two days. It now and then happens that the symptoms just described cease in a few days, even though the patient goes on taking the medicine.

When the potassium salt is not tolerated, the ammonium or sodium salt can sometimes be borne. Thus, in one case, iodide of potassium in ten-grain dose, thrice daily, produced so much headache, sneezing, and running at the nose, that it could not be continued, whilst the same dose of iodide of sodium was easily borne, causing no headache, and only a little running at the nose.

A full dose of carbonate of ammonia or spirits of ammonia given with the iodide of potassium will, it is said, obviate these symptoms of iodism; but, though I have many times put this recommendation to the test, I have seen no decided results, although, perhaps, the ammonia did occasionally control, somewhat, the iodism.

Arsenic will lessen or prevent the eruptions produced by iodides. Dr. Sidney Phillips, of St. Mary's Hospital, reports the case of a patient who took fifteen grains of potassium iodide thrice daily, with the production of marked general purpura; the addition of five minims of the liquor arsenicalis to each dose quite removed the petechial rash, which, however, returned on discontinuing the arsenic, and again disappeared on resuming it. He tested the effect of arsenic four times on this patient, each time removing the petechiæ.

Ten grains of iodide of potassium taken at bedtime will often cut short an acute cold in the head, especially at the onset. It is much less efficacious if the cold attacks the lungs also, and in influenza it appears to be useless. In ten-grain dose several times a day it is said to cure that troublesome and obstinate affection, violent, paroxysmal sneezing. (*See* Arsenic.) It is likewise useful in chronic colds in the head in two or three-grain dose thrice daily. Iodide of potassium is very useful in chronic bronchitis, and may be given profitably with chloride of ammonium; both drugs first increase the amount of expectoration, at the same time making it less viscid. Five grains of potassium iodide, half a grain of tartar emetic, an ounce of syrup of orange peel, and three ounces of water make an excellent mixture, taken in teaspoonful dose, hourly, in acute febrile catarrh of the respiratory tract. It is especially serviceable in the case of children; tartar emetic, acting very like aconite, induces a copious perspiration. During this treatment the patient should of course keep the house, and preferably the room.

The iodide is employed in a great variety of diseases. It is largely employed in syphilis, but is not equally efficacious in all its forms, being more useful in secondary and tertiary syphilis, especially in the latter, where mercury may do harm. The iodide should be preferred to mercury if the health is broken, if mercury has been taken without good results, and if the bones are diseased. It is conspicuously beneficial when the disease has fixed on the periosteum of the bones or fibrous structures of the softer organs and has given rise to nodes. Its action on this form of the disease is almost magical; it soon subdues the pain, and then the nodes, if not of long standing, quickly disappear. In the treatment of syphilitic skin eruptions, tubercular in character, Dr. Neligan prefers it to a salt of mercury. The iodide of potassium is of very great service in syphilis of deep-seated and important organs. It has been commended in syphilitic iritis, but in this affection most authorities prefer mercury. The secondary syphilis of children is best treated with mercury; yet the following somewhat rare form of syphilis yields best to iodine: children a few months or years old show a thickening of the periosteum, which usually attacks the heads of several of the long bones, sometimes also the shafts. The thickening is first felt around the bones, but as the disease advances the neighbouring soft tissues become infiltrated with a firm exudation, which may increase to such a degree that the implicated part of the limb becomes much swollen, the skin very tense, shining, and a little reddened. The affected parts are very painful. When the disease is seated at the head of the bones, the movement of the joint is not impaired. If long uncured, this condition leaves behind it permanent thickening and enlargement; hence we sometimes see children with syphilitic teeth, and blind from syphilitic keratitis, showing considerable enlargement of the heads of several of the long bones.

Certain non-syphilitic periosteal thickenings yield likewise to this remedy; it will, however, be admitted generally that it is at times most difficult to exclude a syphilitic taint.

Iodide of potassium has been recommended in mercurial salivation, but I agree with those observers who maintain that iodide of potassium more often aggravates mercurial salivation; the iodide, however, does sometimes appear to be undoubtedly beneficial.

As the action of the iodide on mercury in the system throws much light upon this question, we will now shortly discuss it. The mercury salts, like those of most other metals, form insoluble compounds with albuminous substances. These compounds are very generally soluble in chlorides, bromides and iodides of the alkalies, but especially in the iodides. Many metals, amongst others mercury and lead, are deposited from the blood in an insoluble form, within the animal structures, and it is by re-dissolving them that iodide of potassium acts, bringing thus the one or the other *again into* the circulation, and so re-subjecting it to the influence of the excretory organs. In this way iodide of potassium will promote the separation of both mercury and lead by the urine, and thus help to free the system from their pernicious effects.

It has been said that iodide of potassium will dissolve the mercury compounds of albumen which have been deposited in the body, and bring them back into the circulation; herein we have the explanation of a well-known property of this salt, namely, that of producing salivation in persons who had previously taken a considerable quantity of mercury but who for the time being were not suffering from this symptom. This being so, it will naturally be anticipated that in a patient under treatment by mercury who has become salivated, iodide of potassium will still further increase the ptyalism, and not check it, and this is my experience. In certain cases it might conceivably happen otherwise, for the iodide has diuretic powers and it may therefore so stimulate the kidneys as to facilitate the separation of this metal in the urine. Should it ultimately be proved that the increased elimination of mercury which the iodide effects is due solely to the mercury being brought back into the circulation, and so under the influence of the kidneys, and that the iodide does not actually promote the exit of the metal by stimulating any of the emunctories, then the iodide must be simply harmful in mercurial salivation.

Quite apart from the presence of mercury, it is taught that iodide of potassium does itself increase the salivary secretion to a variable amount.

The unequalled efficacy of iodide of potassium in eliminating lead from the system through the urine has led to its employment in lead-poisoning. Further on, when treating of lead, it will be shown how, by virtue of its power of eliminating this metal, iodide of potassium may prove useful in certain forms of gout.

It is of signal service in bronchocele, when the enlargement of the thyroid gland is due to hypertrophy, not to cystic formations, or to other causes. Its internal employment is often supplemented by painting the swelling with the tincture or liniment of iodide, or rubbing in the ointment of the iodide of potassium. Iodide of potassium is used also in induration or enlargement of other glands, as of the mamma or testicle, though with less advantage than in bronchocele.

The iodides quicken the absorption of inflammatory effusions, as, for instance, in pleurisy and in certain cases of pericarditis, where the patient's strength is well preserved and the constitutional disturbance not great (Osler), also in inflammatory thickenings of organs.

Iodide of potassium sometimes relieves sciatica and lumbago, although it very often fails to affect either, especially sciatica, even when the pain is worse at night.

Iodide of potassium sometimes benefits chronic rheumatism, chronic matic arthritis, chronic gout, in particular the two former affec- s. It should, however, be always borne in mind that the pains of ndary syphilis, frequently resembling in all respects those of so- ed chronic rheumatism, are liable to be confounded with, and uded among, the manifold affections termed chronic rheumatic. e of the so-called cases of rheumatism relieved by iodide of potas- n are probably cases of syphilis.

he pains which yield to iodide of potassium are mainly those ked by nocturnal increase of suffering, a symptom which may be epted as a strong indication for the employment of this medicine n indication holding true, whether the pains are referable to umatism or to some other source. Syphilitic pains, as is well wn, are generally worse at night, so also are the pains of many es of chronic rheumatism.

odide of potassium is sometimes singularly useful in peptic and nchial asthma. Five grains or more, three times a day, may be uired. Now and then its good effects are not manifested for some e, though, possibly, in such a case larger doses would bring relief re promptly. The late Dr. Hyde Salter, whilst admitting the great cacy of this drug in some instances, was inclined to think that in majority of cases it was useless. My limited experience leads me think it more frequently useful than Dr. Salter was willing to nit. In one case of bronchitic asthma I tried a 2 per cent. solution potassium iodide as a spray, using about a drachm, diluted with er, thrice daily. It greatly relieved the patient during her attacks, seemed quite as efficacious as Himrod's powder, whilst its effects ned more permanent than the powder or than the iodide of methyl, ch is also useful in paroxysms, acting in part, no doubt, by virtue ts iodine constituent.

odide of potassium has sometimes obviated barrenness, due presum- y to syphilis. Many employ it to lessen the secretion of milk.

odide of potassium acts occasionally as a powerful diuretic in ght's disease. I have seen it remove all the dropsy in cases of roughly water-logged patients, every part of whose bodies were ematous: the legs swollen till they could not be bent, the skin shiny n distension, and the abdomen distended with fluid. The iodide increased the scanty urine in cases of this kind from a few ounces ly up to 30, 50, 60, and 120 ounces per diem, till the dropsy had dis- eared, every vestige of it, within a fortnight. While, however, this g increased the urinary water and removed the dropsy, it produced y little effect on the total amount of albumen. Of course, in the eased quantity of urine, the relative amount of albumen was inished, but this meant simply dilution of the urinary ingredients uding the albumen. Where the iodide proved so useful, I at one e thought the patient must have suffered from syphilis of the neys, and that the drug removing this disease, the kidneys had recovered their lost power and eliminated the dropsical fluid. In some of my cases, however, there was no reason to conclude that the patients were syphilitic, the disease having followed scarlet fever, or having, apparently, originated from cold. Like other diuretics, for instance, resin of copaiba, its action is very uncertain. In many cases, in most indeed, the iodide fails altogether; this uncertainty can in part be explained as a question of dosage, for, whilst a moderate dose of from five to ten grains may act powerfully in a certain number of cases, in others the dose must be greatly increased. In one case I did not obtain diuretic action till I gave one hundred grains daily, and even this dose had to be increased to two hundred daily in order to maintain the effect and eliminate all the dropsy. Now, in most patients, large doses will bring on severe iodism and depression, before, probably, the diuretic dose has been reached. In my experience, iodide of potassium, like digitalis, ceases to act as a diuretic when the dropsy has disappeared.[1] Dr. Balfour speaks of the free diuresis caused by full doses of iodide of potash.

In aneurism Dr. Balfour recommends iodide of potassium in doses of from five to thirty grains continued for a considerable time, even for twelve months, conjoined with the recumbent posture and a moderately restricted diet; and he narrates several cases strikingly confirmatory of the efficacy of this mode of treatment. Dr. Chuckerbutty supports his statements, and I, too, have seen on several occasions large doses of the iodide of potassium afford prompt relief in the severe pain of aneurism.[2] The drug acts presumably by lessening the size of the tumour and so its pressure on the nerves; this by a depressant action upon the heart (whence lowering of blood pressure), and perhaps also by some direct effect upon the aneurysm. In some cases it is certain that the tumour grows smaller and less pulsatile. Patients sometimes assert that a slight discontinuance of the iodide of only 36 to 48 hours is always followed by an increase in the pain, which again ceases on returning to the remedy. To afford relief large doses are sometimes required, up to 130 grains or more daily; indeed, the drug cannot be considered to have had a fair trial till at least thirty grains thrice daily have been administered.

Inasmuch as aneurisms often occur in syphilitic persons, the drug may in some cases act antisyphilitically in some unexplained way, but certain it is that in cases quite free from syphilis it is also highly beneficial.

The great value of iodide of potassium in aneurysm, either as a palliative or curative agent, is admitted by most observers now.

Dr. Huchard claims to have cured twenty cases of angina pectoris by the administration of fifteen to thirty grains of sodium iodide daily. He considers angina to be an affection of the arteries, inflammatory in nature, and he maintains that, if employed early enough, iodide of sodium will cure this condition by obviating the narrowing of the mouths of the coronary vessels. Whitla, among others, speaks very highly of the treatment of angina by the iodides of potassium and sodium.

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[1] In respect of the above it should be remembered that in dropsies a free diuresis is sometimes started in a most inexplicable way.

[2] This is now very generally accepted.

Iodine has been detected in the blood, saliva, milk, and urine; it has been found, even, in the urine of the child at the breast, whose mother is taking iodide of potassium. Its great diffusion-power explains its presence in all the fluids bathing the tissues or moistening the cavities. It appears in a few minutes in the urine, and still more rapidly in the saliva. The rapidity of its absorption is of course influenced by the state of the stomach and vascular system, the absorption occurring more slowly when these are replete. The statements concerning its influence on the various constituents of the urine are so discrepant, and the observations made on the subject are so imperfect, that at present our knowledge in this respect must be considered untrustworthy. The drug is rapidly separated from the body, and, even after large doses, soon ceases to be discoverable in the urine; indeed, after withholding the drug, every trace of it may vanish in less than twenty-four hours. It is stated, on doubtful grounds, that it may be detected in the saliva for some days after it has ceased to appear in the urine.

Some writers hold that iodide of potassium given in large doses, for long periods, may produce albuminuria, and even Bright's disease.

Atkinson finds that iodide of potassium often causes oxalates to appear in the urine.

It is said that in Bright's disease iodides are not eliminated by the kidneys; in these cases Sir Dyce Duckworth's statement is that their appearance in the urine is delayed for an hour or longer.

Five grains three times a day is generally a sufficient dose. Sometimes, as in rheumatoid arthritis, and in syphilis, no benefit is obtained until much larger quantities, ten, fifteen, or even twenty grains, are given at a dose; still larger doses are at times called for, and in general where the small dose fails we should not hesitate to push the dose.

Large doses arrest the rapid sloughing of certain syphilitic sores and promote the healing process. Full doses sometimes succeed when smaller ones fail.

For the removal of syphilitic nodes from the membranes of the brain five to ten grains, repeated three times a day, are generally sufficient. At first the drug may intensify the pain, subsequently the disease declines rapidly. In no other affection does this medicine yield such striking results, but it may be necessary to push the drug rather rapidly.

Iodide of potassium may be conveniently administered in milk.

Prescribed in mixtures containing free acid there is liable to be a separation of free iodine as a sediment. Spirits of nitrous ether should be neutralized before admixture with an iodide. The acid subnitrate of bismuth is incompatible.

BROMIDE OF POTASSIUM, SODIUM, AMMONIUM, AND LITHIUM

THESE salts in their physical and chemical properties are closely allied to the corresponding iodides; yet in their action on the body the bromides and iodides exhibit considerable differences.

One part of bromide of potassium, in five parts of glycerine, has proved useful, it is said, as a local application to ease pain in hæmorrhoids, fissure of the rectum, and in painful growths.

It is averred by some writers that merely brushing the pharynx and soft palate with a solution of the bromide is sufficient to quell the irritability and to permit a laryngoscopic examination with comfort to the patient. Many observers, however, question this use of the bromide, and Dr. Mackenzie considered that ice was more efficacious; a cocaine solution, 10 or 20 per cent., painted on, or a spray of 5 per cent. strength is undoubtedly much more efficacious.

When taken internally, in moderate doses, for some time, or, in larger doses, for a shorter time, bromide of potassium diminishes the sensibility of the soft palate, uvula, and upper portion of the pharynx, as evidenced by the absence of movement in these parts when they are touched. Zœpffel finds that bromide of potassium affects the reflex irritability but not the sensibility of the pharynx, and that, though after its use, irritation of the throat will not excite deglutition, yet the pain of operations may not be lessened. He agrees with Voisin, that thirty grains may be insufficient to affect the pharynx, and that it may be necessary to repeat this dose two or three times, at intervals of a few hours. It has been recommended to give the bromides in this way to reduce the excitability of the throat preparatory to a laryngoscopical examination, but in cocaine and ice we have more efficient means at our command.

Assuming that the bromides possessed the property of diminishing the sensibility or the reflex irritability of the pharynx, it was naturally surmised that they would also lessen the excitability of the larynx, and thus prove useful in those diseases in which spasmodic contraction of the glottis is present, such as whooping-cough and laryngismus stridulus. Now, as to whooping-cough, all observers will admit that whilst some cases are altogether uninfluenced by this remedy, neither the frequency nor the severity of the paroxysms of coughing being controlled, in other cases the drug appears to diminish both the one and the other. On examination, the bromide will, I ve, be found serviceable in simple uncomplicated whooping-h; but if there is fever, or much catarrh of the lungs, if there is umonia, or tuberculosis, if the child is teething, and the gums swollen, red, and painful, or if there is any gastric irritation, , until these complications have been met by appropriate treat-t, this remedy will fail. When the case has been reduced to its ple form, the bromide of potassium does certainly influence the ase, lessening, as has been said, both the frequency and severity he paroxysms.

or the reasons just stated it has been found to be of more service he summer, *i.e.*, when the weather is genial and mild and the ve complications are less frequent. As in the case of other remedies whooping-cough, the bromides are more efficacious in some lemics than in others.

he efficacy of bromide of potassium in laryngismus stridulus is ject to conditions very similar to those which limit its usefulness whooping-cough. Any irritation, such as that from teething, must removed before the remedy appears to manifest its power. In cold nging, moreover, we possess a cure for laryngismus stridulus, ready, mpt, and efficient, and we shall, therefore, not often need to have ourse to the bromide. (*See* Cold Bath.)

The bromides are sometimes useful in whooping-cough, and laryn-mus stridulus when complicated by convulsions. During a oxysm of laryngismus stridulus or whooping-cough, the obstruc-n in the larynx becomes sometimes so urgent as to induce a very perfect oxidation of the blood, a partial asphyxia, and as its result attack of convulsions. Convulsions, moreover, are not uncommon laryngismus, quite independently of asphyxia, or of an attack of wing breathing: the early and less developed stage of these nvulsive attacks is manifested in carpo-pedal contractions, squinting, . The bromides will control the recurrence of these convulsions, en when the disease itself is apparently otherwise uninfluenced.

In those cases of laryngismus stridulus where, from the effects of me irritation, cold sponging is unable to avert the convulsions, the omide of potassium will, in most instances, prove effectual, and us obviate one of the gravest dangers of this disease. It will be nderstood that it is when the cold sponging fails, that we shall have ecourse to the bromides.

The bromide of potassium will much benefit a curious affection we ometimes meet with in children, in whom from the time of birth it ay have been observed that whilst they can swallow solids with ase, they are choked every time they try to drink. This strange ffection is in no way connected with diphtheria, or with any visible ffection, or malformation, of the throat.

The bromides, so far as we know, appear to have very little in-uence upon the stomach.

In certain cases these salts exert a beneficial influence on the intestines, as, for instance, in a form of colic, which sometimes affects children from a few months to one or two years old, in which the walls of the belly are retracted and hard, while the intestines, at one spot, are visibly contracted into a hard lump, the size of a small orange, which contraction can be traced, through the walls of the belly, travelling from one part of the abdomen to another. These colicky attacks, unconnected with constipation, diarrhœa, or flatulence, occur very often, and produce excruciating pain. Sometimes they are associated with a chronic aphthous condition of the mouth. They generally resist all kinds of treatment except the bromides.

Like the iodides, these salts pass quickly into the blood, and we shall now treat of their influence on the organs to which they are conveyed by this fluid, though doubtless the effects just described in laryngismus, whooping-cough, etc., are largely absorption effects.

The bromides lessen considerably the functions of the brain and cord. Experimentally, it has been found that in animals under their influence, irritation of the motor centres of the brain fails to excite convulsions. Thus Albertoni records that if potassium bromide be administered for several weeks to dogs, the excitability of the cortex of the brain may be so much diminished that it is impossible to excite convulsions in them by irritation of the brain surface. Accordingly, though bromide of potassium is used in a variety of diseases its virtues are chiefly conspicuous in convulsive states.

It is serviceable in all forms of convulsions—in epilepsy, in the convulsions of Bright's disease, and in the convulsions of children, whether due to centric or eccentric causes.

In no disease is the bromide of potassium more signally efficacious than in epilepsy, though it is not equally useful in all forms of this disease; thus attacks of *petit mal* are often unbenefited, whilst the convulsive form of epilepsy is remarkably amenable to the drug, the fits, under its influence, becoming much less severe and less frequent. Even when of great severity, and repeated perhaps several times a day, the fits may be postponed for weeks, and even months, nay, in some cases, for years.

Cases of the convulsive form, however, occasionally occur, over which the bromide appears to be powerless, the fits recurring as often and as severely as if no medicine had been taken; and sometimes, when the drug does arrest the epileptic convulsion, the patient becomes dull, irritable, idiotic, conditions which on the recurrence of a fit may disappear. Again, though able to stop the greater attacks, bromides may increase the frequency of the attacks of *petit mal*. In a given case it is not possible to foretell when the medicine will succeed, and when it will fail. As might be expected, the effects of the drug are most marked when the disease is of short standing.

eir Mitchell recommends the bromide of lithium in epilepsy.

This salt contains a larger percentage of bromine than either the sodium or potassium compounds, and according to Dr. Mitchell it acts more powerfully for this reason, hence smaller doses may be given. Dr. Mitchell thinks that the lithium salt succeeds sometimes when the potassium and sodium salts fail, and as a hypnotic, he says, "it is superior to the potassium and other salts of bromine." Echeverria, on the other hand, thinks it is inferior to the potassium salt in epilepsy, but, as a hypnotic, superior both to the sodium and calcium salts.

Echeverria considers the potassium salt much superior to the ammonium salt in epilepsy; the ammonium salt is more disagreeable to the taste. In epileptic maniacal excitement Echeverria finds bromide of sodium far less serviceable than bromide of ammonium. He moreover asserts that bromides generally fail to suppress mental excitement in epileptics unless combined with some other narcotic such as conium, cannabis indica, hyoscyamus, chloral, or, better still, ergot of rye.

With regard to the several bromides there are differences of opinion among authorities as to their exact order of merit. Dr. Gowers considers that they are nearly on a level of activity, but that the bromides of sodium and lithium are slightly weaker therapeutically than the bromides of potassium and ammonium, and that of these two latter the potassium salt is a little better borne.

We would urge that if the bromide of sodium will answer in a given case it should have the preference, other things being equal. Dr. Brown-Séquard advocated the use of a combination of the bromides.

In mild epileptic cases ten grains three times daily is sufficient. When the attack occurs only at night, the best way to avert it is to give a full dose of thirty grains at bedtime. Echeverria finds that the average dose required is sixty grains daily, but that in severe cases a much larger quantity may be needed. Dr. Gowers says: "The best results are usually obtained with not more than a drachm a day," and again, "Few patients are able to bear more than a drachm and a half without becoming what is termed 'bromised.'" In respect to the dose, Voisin says, "I have employed for many years a method which has given me the best results, which consists in determining the condition of reflex nausea by introducing a spoon as far as the epiglottis. I have remarked that a therapeutic dose of the bromide of potassium is not attained till reflex nausea is suppressed; it is not till then that the bulb is certainly acted on, and its excito-motory force diminished. . . . The study of other reflex phenomena, such as lachrymation, cough and sneezing, enables us to follow the action of the medicine upon the bulb and spinal cord. The dose should not be increased beyond the suppression of reflex nausea, but it should be given continuously *for years together*. If the mala [illegible] orated, or in process of cure, at the end of two years of amelioration, the remedy, instead of being administered every day, may be given every second, third, or fourth day, provided reflex nausea be always and certainly absent." Voisin considers that the early manifestation of toxic effects is of good, their late appearance of bad, augury.

If the patient is not cured, but only benefited, by the bromide, it may be continued for months or years. But its administration should be suspended at times for a week or ten days, or on two days in each week, say Monday and Thursday, otherwise the system becomes accustomed to it, and it loses its influence. If, in a case where the drug has lost its influence, and the disease has recurred in its old severity, it is withheld for a time, and then resumed, it will again manifest all its previous efficacy.[1]

It has been asserted and denied that chloride of potassium is as efficacious as bromide of potassium in epilepsy; as a matter of fact, the chloride is, practically, never used.

We have already spoken of the effect of bromide of potassium on the convulsions which sometimes accompany whooping-cough and laryngismus stridulus. The bromide will often prove useful in many other diseases associated with general convulsions. Of course in every case the exciting cause of the convulsive attacks should, if possible, be removed. The convulsions caused by intestinal worms sometimes resist this remedy completely.

Bromide of potassium will often check the convulsions resulting from simple meningitis, when the fits, which sometimes persist after the decline of the inflammation, inflict serious damage.

In tetanus, bromide of potassium in full dose, not less than half an ounce during the day, with the concurrent use of chloral at night as a soporific, furnishes a valuable treatment (H. C. Wood). The same may also be used in strychnia poisoning, again in full dose.

Many writers extol bromide of potassium in the incidents of teething, averring that it lessens pain, obviates irritability and restlessness, and prevents convulsions. Bromide of potassium checks the salivation sometimes occurring in pregnancy, and succeeds here at times after the failure of atropine and pilocarpine (Schunn). The bromides are most valuable hypnotics. Voisin, referring to his patients in the Bicêtre, says, "The hypnotic action upon them was very remarkable night and day. Some were obliged to sleep for a few minutes at a time in the midst of their work. None, in spite of whatever efforts they made to the contrary, could resist sleep directly after their evening meal." As hypnotics they have been found of especial use in obviating that sleeplessness and wandering at night which is not unfrequently manifested during convalescence from acute diseases.

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[1] Many other bromides have from time to time been employed; thus, bromide of Strontium, Rubidium and Cæsium. These have been used in epilepsy as substitutes for the other bromides; they may be tried failing the use of the commoner salts. Strontium and Rubidium bromides have been given in the dose of 5–30 grains. The Cæsium salt is very expensive, it is given in smaller dose, say gr. 3–5, thrice daily. Quite recently (*Lancet*, Sept. 26th, 1896), Dr. Roche, of Dublin, reports very good results with Strontium bromide in epilepsy, 10 grains thrice daily, increasing the dose if need be up to one drachm twice daily. The bromide rash was liable to occur; it was controlled by the liquor arsenicalis.

Bromide of Gold has been given in epilepsy. Goubert recommends it in
dose $\frac{1}{20}$–$\frac{1}{10}$ grain *per diem* (for children),
$\frac{1}{8}$ – $\frac{1}{5}$ „ „ „ („ adults).
The small dose, if these results be confirmed, is very interesting, especially in regard to the theory that the bromine is the effective agent. (See further Tuke's *Dictionary of Psychology*, art. "Sedatives.")

As a soporific, bromide of potassium is especially useful in the sleeplessness caused by worry or overwork, or that occurring at the climacteric, or caused by menstrual disturbances. The brief amount of sleep obtained by these patients is often harassed by nightmare, whilst the sleeplessness further depressing the nervous system and other functions, the patients become still more depressed and irritable in temper. They are excessively nervous, and may easily give way to crying. In such a condition the bromides in twenty to twenty-four grain dose, at night, are invaluable. They induce quiet, dreamless refreshing sleep, and even where they do not induce an equal amount of sleep, they are greatly preferable to other soporifics or narcotics, since they cause no ill-effects on the stomach, liver, or intestines such as opiates do. In the conditions described their good effects are more marked than the effects of other narcotics, such as chloral for instance, so much so that it is fair to conclude that the bromides act beneficially here in excess of their mere hypnotic action.

There is a group of symptoms, variously combined, occurring mostly in women, generally townspeople, which may be thus described: the patient is very "nervous," subject, often, to great despondency, at times so unendurable as to make her, as she expresses it, feel as if she should go out of her mind; she is very irritable, is unable to fix her attention, and noises distress her; she sleeps badly, her rest being broken by harassing dreams. This condition often arises from overwork, grief, worry, or too long residence in town, or want of change. Bromide of potassium will always cure this group of symptoms, and it is indicated whether these symptoms occur independently or are associated with other states, such as the change of life, or migraine, etc. In such a case the bromide acts by favouring sleep, and thus restoring the nervous system.

The bromide has often been extolled for its efficacy in the treatment of the symptoms pertaining to the "change of life" and in migraine; yet, though often very serviceable, it often fails. The distressing symptoms witnessed during the change of life are very various, but occur generally in more or less *definite groups*. The group of symptor

I have just described appears commonly at the menopause; it yields, almost always, to the bromides. This same group is often associated with heats and flushings, followed by free perspirations with which there may be prostration, sometimes extreme. These latter symptoms also will generally give way to the bromide. If, however, the heats, flushings, and perspirations predominate over the mental depression, nervousness, irritability and sleeplessness, then small doses of nitrite of amyl (*see* Amyl) will generally prove more serviceable than bromide of potassium.[1] At the change of life patients often complain of much fluttering at the heart, a symptom best controlled by large doses of the astringent preparations of iron (*see* Iron); this treatment by iron will be specially called for if the patient is anæmic. All the troubles of the menopause, except sleeplessness, are often much benefited by valerianate of zinc, which may be given thrice daily after food, whilst the bromide is taken at bedtime.

Occasionally the troubles just described yield but partially to the treatment here recommended, or, if removed for a time, recur subsequently with greater intensity, and eventually become unendurable. The only resource then is thorough change of air and scene, *e.g.*, travelling for three or six months.

In not a few cases of migraine (sick headache and its allies), bromide of potassium, though often of great service, fails altogether. In the article on croton chloral I have treated of migraine, and here I need only add that we often find the headache associated with the group of symptoms previously described, namely, nervous depression, sleeplessness, irritability, etc. In such a case the patient may have been troubled, perhaps for years, with attacks of migraine, at intervals of a month or so, but on the occurrence of this group of symptoms the attacks of migraine become much more frequent and severe, and indeed the pain may then become continuous, though, generally, once during the day, it becomes paroxysmally worse. The irritability, sleeplessness, etc., of the menopause group are indications of a depressed nervous system, and this depression accounts for the increased frequency of the migrainous attacks and the fact that these attacks are often excited by the slightest disturbances. Here bromide of potassium, by producing refreshing sleep, soothes the nervous system, dispels the other symptoms, and at the same time lessens the frequency and severity of the headaches.

In some cases, derangements of the womb excite migrainous attacks either at a normal or at a menorrhagic period. Here, again, bromide of potassium is useful, and its efficacy, when the attacks are caused by menorrhagia, is not entirely due to its checking this condition, since, en between the periods, it may improve the migraine before the t attack of menorrhagia. Whilst speaking of uterine disturbances an exciting cause of these headaches, I should mention that some- es these same disturbances are due to uterine mischief, generally the neck of the uterus; such cases remain rebellious to any treat- ent until the womb has been cured by local treatment.

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[1] Whilst it removes the heats, flushings, and perspirations, the nitrite of amyl also controls the other group of symptoms, quieting the nervous system, and producing sound, dreamless sleep, which further relieves the nervousness and depression.

Sometimes during an attack of migraine a full dose of bromide duces sleep, and after a few hours the patient awakens free from adache.

Sometimes, in the later months of pregnancy, a woman becomes, at ght, the prey of the most frightful imaginings, labouring under the pression perhaps that she has committed, or is about to commit, me great crime or cruelty, such as the murder of her children or r husband. The bromide will dispel these delusions, and induce lm, refreshing sleep.

Bromide of potassium is of great service in the treatment of children bject to night-screaming, a symptom which appears to be allied to ghtmare. Children from a few months to several years old may be ttacked with this affection. Sometimes the attack occurs only once twice a week, as is usually the case with older children, sometimes is repeated several times each night. The screaming may last only few seconds, or it may endure for several hours. While screaming, hese children are generally quite unconscious of what is occurring round them, and cannot recognise, or be comforted by, their friends. hey are generally horribly frightened. With the screaming and he fright, squinting sometimes occurs, and may after some time ecome permanent.

Another condition met with in children a few years old is ery similar to somnambulism, but sometimes apparently allied to pilepsy. In this state the child gets out of bed while fast asleep, walks about the house, and performs, as if awake, various acts, quite unconsciously. This stage is not accompanied by any terror. These affections being connected very generally with deranged digestion, the condition of the stomach or intestines should be attended to, but, even in spite of derangement of the alimentary tract, the bromide will give quiet and refreshing sleep.

The nightmare of adults will generally yield to the same medicine.

Bromide of potassium is often of conspicuous benefit in delirium tremens, removing the delusions, calming the delirium, and inducing sleep; its efficacy is most apparent in the earlier stages, before the delirium becomes furious. It is further of great service in dispelling the delusions which may remain after the partial subdual of the attack. In delirium tremens bromides often succeed where opium fails.

Bromides will sometimes induce sleep in febrile diseases, but in such cases opium or chloral, or both combined, produce a far more certain and beneficial result.

In certain cases these salts exert a beneficial influence on the intestines, as, for instance, in a form of colic, which sometimes affects children from a few months to one or two years old, in which the walls of the belly are retracted and hard, while the intestines, at one spot, are visibly contracted into a hard lump, the size of a small orange, which contraction can be traced, through the walls of the belly, travelling from one part of the abdomen to another. These colicky attacks, unconnected with constipation, diarrhœa, or flatulence, occur very often, and produce excruciating pain. Sometimes they are associated with a chronic aphthous condition of the mouth. They generally resist all kinds of treatment except the bromides.

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Dr. Weir Mitchell recommends the bromide of lithium in epilepsy.

s salt contains a larger percentage of bromine than either the ium or potassium compounds, and according to Dr. Mitchell it s more powerfully for this reason, hence smaller doses may be en. Dr. Mitchell thinks that the lithium salt succeeds sometimes en the potassium and sodium salts fail, and as a hypnotic, he s, "it is superior to the potassium and other salts of bromine." heverria, on the other hand, thinks it is inferior to the potassium t in epilepsy, but, as a hypnotic, superior both to the sodium and cium salts.

Echeverria considers the potassium salt much superior to the ammnium salt in epilepsy; the ammonium salt is more disagreeable to e taste. In epileptic maniacal excitement Echeverria finds bromide sodium far less serviceable than bromide of ammonium. He oreover asserts that bromides generally fail to suppress mental citement in epileptics unless combined with some other narcotic ch as conium, cannabis indica, hyoscyamus, chloral, or, better still, got of rye.

With regard to the several bromides there are differences of inion among authorities as to their exact order of merit. Dr. Gowers nsiders that they are nearly on a level of activity, but that the omides of sodium and lithium are slightly weaker therapeutically an the bromides of potassium and ammonium, and that of these o latter the potassium salt is a little better borne.

We would urge that if the bromide of sodium will answer in a ven case it should have the preference, other things being equal. . Brown-Séquard advocated the use of a combination of the omides.

In mild epileptic cases ten grains three times daily is sufficient. hen the attack occurs only at night, the best way to avert it is to ve a full dose of thirty grains at bedtime. Echeverria finds that e average dose required is sixty grains daily, but that in severe cases much larger quantity may be needed. Dr. Gowers says: "The st results are usually obtained with not more than a drachm a ay," and again, "Few patients are able to bear more than a drachm nd a half without becoming what is termed 'bromised.'" In respect o the dose, Voisin says, "I have employed for many years a method which has given me the best results, which consists in determining the condition of reflex nausea by introducing a spoon as far as the epiglottis. I have remarked that a therapeutic dose of the bromide of potassium is not attained till reflex nausea is suppressed; it is not till then that the bulb is certainly acted on, and its excito-motory force diminished. . . . The study of other reflex phenomena, such as lachrymation, cough and sneezing, enables us to follow the action of the medicine upon the bulb and spinal cord. The dose should not be increased beyond the suppression of reflex nausea, but it should be given continuously for *years together*. If the malady be ameliorated, or in process of cure, at the end of two years of amelioration, remedy, instead of being administered every day, may be given e second, third, or fourth day, provided reflex nausea be always certainly absent." Voisin considers that the early manifestatio toxic effects is of good, their late appearance of bad, augury.

If the patient is not cured, but only benefited, by the bromid may be continued for months or years. But its administration sh be suspended at times for a week or ten days, or on two days in week, say Monday and Thursday, otherwise the system becomes ac tomed to it, and it loses its influence. If, in a case where the has lost its influence, and the disease has recurred in its old seve it is withheld for a time, and then resumed, it will again manifes its previous efficacy.[1]

It has been asserted and denied that chloride of potassium i efficacious as bromide of potassium in epilepsy; as a matter of the chloride is, practically, never used.

We have already spoken of the effect of bromide of potassiu the convulsions which sometimes accompany whooping-cough laryngismus stridulus. The bromide will often prove useful in other diseases associated with general convulsions. Of cour every case the exciting cause of the convulsive attacks shou possible, be removed. The convulsions caused by intestinal sometimes resist this remedy completely.

Bromide of potassium will often check the convulsions res from simple meningitis, when the fits, which sometimes persist the decline of the inflammation, inflict serious damage.

In tetanus, bromide of potassium in full dose, not less than h ounce during the day, with the concurrent use of chloral at ni a soporific, furnishes a valuable treatment (H. C. Wood). The may also be used in strychnia poisoning, again in full dose.

Many writers extol bromide of potassium in the incidents of ing, averring that it lessens pain, obviates irritability and restles d prevents convulsions. Bromide of potassium checks the saliva- n sometimes occurring in pregnancy, and succeeds here at times er the failure of atropine and pilocarpine (Schunn). The bro- des are most valuable hypnotics. Voisin, referring to his patients the Bicêtre, says, "The hypnotic action upon them was very markable night and day. Some were obliged to sleep for a few nutes at a time in the midst of their work. None, in spite of hatever efforts they made to the contrary, could resist sleep directly ter their evening meal." As hypnotics they have been found of pecial use in obviating that sleeplessness and wandering at night hich is not unfrequently manifested during convalescence from acute iseases.

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[1] Many other bromides have from time to time been employed; thu mide of Strontium, Rubidium and Cæsium. These have been used in e as substitutes for the other bromides; they may be tried failing the the commoner salts. Strontium and Rubidium bromides have been g the dose of 5–30 grains. The Cæsium salt is very expensive, it is g smaller dose, say gr. 3–5, thrice daily. Quite recently (*Lancet*, Sept. 26th Dr. Roche, of Dublin, reports very good results with Strontium bro epilepsy, 10 grains thrice daily, increasing the dose if need be up drachm twice daily. The bromide rash was liable to occur; it was con by the liquor arsenicalis.

Bromide of Gold has been given in epilepsy. Goubert recommen
dose $\frac{1}{20}$–$\frac{1}{10}$ grain *per diem* (for children),
$\frac{1}{8}$ – $\frac{1}{5}$ " " " (" adults).
The small dose, if these results be confirmed, is very interesting, es in regard to the theory that the bromine is the effective agent further Tuke's *Dictionary of Psychology*, art. "Sedatives.")

As a soporific, bromide of potassium is especially useful in the eeplessness caused by worry or overwork, or that occurring at the imacteric, or caused by menstrual disturbances. The brief amount f sleep obtained by these patients is often harassed by nightmare, hilst the sleeplessness further depressing the nervous system and ther functions, the patients become still more depressed and irritable n temper. They are excessively nervous, and may easily give way to rying. In such a condition the bromides in twenty to twenty-four rain dose, at night, are invaluable. They induce quiet, dreamless re- eshing sleep, and even where they do not induce an equal amount of leep, they are greatly preferable to other soporifics or narcotics, since hey cause no ill-effects on the stomach, liver, or intestines such as piates do. In the conditions described their good effects are more arked than the effects of other narcotics, such as chloral for instance, much so that it is fair to conclude that the bromides act beneficially ere in excess of their mere hypnotic action.

There is a group of symptoms, variously combined, occurring mostly women, generally townspeople, which may be thus described: the atient is very "nervous," subject, often, to great despondency, at mes so unendurable as to make her, as she expresses it, feel as if he should go out of her mind; she is very irritable, is unable to fix er attention, and noises distress her; she sleeps badly, her rest eing broken by harassing dreams. This condition often arises from verwork, grief, worry, or too long residence in town, or want of hange. Bromide of potassium will always cure this group of ymptoms, and it is indicated whether these symptoms occur inde- endently or are associated with other states, such as the change of fe, or migraine, etc. In such a case the bromide acts by favouring leep, and thus restoring the nervous system.

The bromide has often been extolled for its efficacy in the treatment f the symptoms pertaining to the "change of life" and in migraine; et, though often very serviceable, it often fails. The distressing ymptoms witnessed during the change of life are very various, but ccur generally in more or less definite groups. The group of symptoms

I have just described appears commonly at the menopause; it yields, almost always, to the bromides. This same group is often associated with heats and flushings, followed by free perspirations with which there may be prostration, sometimes extreme. These latter symptoms also will generally give way to the bromide. If, however, the heats, flushings, and perspirations predominate over the mental depression, nervousness, irritability and sleeplessness, then small doses of nitrite of amyl (*see* Amyl) will generally prove more serviceable than bromide of potassium.[1] At the change of life patients often complain of much fluttering at the heart, a symptom best controlled by large doses of the astringent preparations of iron (*see* Iron); this treatment by iron will be specially called for if the patient is anæmic. All the trouble of the menopause, except sleeplessness, are often much benefited b valerianate of zinc, which may be given thrice daily after food, whil the bromide is taken at bedtime.

Occasionally the troubles just described yield but partially to t treatment here recommended, or, if removed for a time, recur sub quently with greater intensity, and eventually become unendural The only resource then is thorough change of air and scene, e travelling for three or six months.

In not a few cases of migraine (sick headache and its allies), bron of potassium, though often of great service, fails altogether. In article on croton chloral I have treated of migraine, and here I r only add that we often find the headache associated with the grou symptoms previously described, namely, nervous depression, sleepl ness, irritability, etc. In such a case the patient may have b troubled, perhaps for years, with attacks of migraine, at intervals month or so, but on the occurrence of this group of symptoms attacks of migraine become much more frequent and severe, and in the pain may then become continuous, though, generally, once du the day, it becomes paroxysmally worse. The irritability, sleepl ness, etc., of the menopause group are indications of a depressed ner system, and this depression accounts for the increased frequenc the migrainous attacks and the fact that these attacks are o excited by the slightest disturbances. Here bromide of potassi by producing refreshing sleep, soothes the nervous system, dispels other symptoms, and at the same time lessens the frequency severity of the headaches.

In some cases, derangements of the womb excite migrainous att either at a normal or at a menorrhagic period. Here, again, brom of potassium is useful, and its efficacy, when the attacks are caused menorrhagia, is not entirely due to its checking this condition, si

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[1] Whilst it removes the heats, flushings, and perspirations, the nitrit amyl also controls the other group of symptoms, quieting the nervous syst and producing sound, dreamless sleep, which further relieves the nervousn and depression.

en the periods, it may improve the migraine before the
of menorrhagia. Whilst speaking of uterine disturbances
ng cause of these headaches, I should mention that some-
same disturbances are due to uterine mischief, generally
of the uterus; such cases remain rebellious to any treat-
the womb has been cured by local treatment.

s during an attack of migraine a full dose of bromide
p, and after a few hours the patient awakens free from

s, in the later months of pregnancy, a woman becomes, at
rey of the most frightful imaginings, labouring under the
perhaps that she has committed, or is about to commit,
crime or cruelty, such as the murder of her children or
d. The bromide will dispel these delusions, and induce
hing sleep.

f potassium is of great service in the treatment of children
ight-screaming, a symptom which appears to be allied to
Children from a few months to several years old may be
th this affection. Sometimes the attack occurs only once
eek, as is usually the case with older children, sometimes
d several times each night. The screaming may last only
ds, or it may endure for several hours. While screaming,
en are generally quite unconscious of what is occurring
n, and cannot recognise, or be comforted by, their friends.
enerally horribly frightened. With the screaming and
squinting sometimes occurs, and may after some time
nanent.

condition met with in children a few years old is
r to somnambulism, but sometimes apparently allied to
n this state the child gets out of bed while fast asleep,
the house, and performs, as if awake, various acts, quite
ly. This stage is not accompanied by any terror. These
eing connected very generally with deranged digestion,
n of the stomach or intestines should be attended to, but,
e of derangement of the alimentary tract, the bromide will
nd refreshing sleep.

tmare of adults will generally yield to the same medicine.

of potassium is often of conspicuous benefit in delirium
moving the delusions, calming the delirium, and inducing
efficacy is most apparent in the earlier stages, before
n becomes furious. It is further of great service in dis-
delusions which may remain after the partial subdual of the
delirium tremens bromides often succeed where opium fails.

will sometimes induce sleep in febrile diseases, but in
opium or chloral, or both combined, produce a far more
beneficial *result.*

To produce sleep twenty to thirty grains should be given at night, and should this prove insufficient, a like dose may be taken in the morning. In delirium tremens twenty to thirty grains, or even more, may be given every two hours till the patient falls asleep.

The bromide is soothing in hysteria, gives greater self-control, and prevents hysterical paroxysms.

It is also used with decided benefit in certain derangements of the organs of generation. Large doses are said to lessen the natural menstrual discharge. In some forms of menorrhagia it is equal, if not superior, to any remedy we possess, but it is more useful in the flooding of younger than of older women. It is very useful in the case of young women who menstruate too often as well as too copiously. It first regulates the time of the discharge and often lessens the amount. It is also very serviceable in the floodings, or too frequent menstruation, which occur at the change of life, and at the same time it relieves many other of the troubles incidental to the menopause. Over that form of flooding which is due to uterine tumours of various kinds it exerts in many cases less control than ergot and some other remedies. To check profuse menstruation, the administration of bromides must be regulated by the circumstances of the case. Thus if the loss of blood occurs only at the natural period, the medicine is then commenced about a week before, and when the menstrual flux has ceased the remedy is discontinued till the next attack is about to begin. On the other hand, when the loss of blood occurs every two or three weeks, or oftener, the medicine must be given without intermission till the loss is controlled; but, even when the discharge has been brought to its right period and amount, it is still desirable to give a few doses for a short time before each monthly period. Ten grains three times a day is a dose sufficient in the flooding of young women, but much larger doses are required in the more obstinate forms which depend on organic changes in the womb.

This remedy has been recommended by Dr. Begbie in puerperal mania and in nymphomania. Dr. Clark also says that it reduces sexual excitement in those instances of hysterical excitement verging on nymphomania. Small doses are unavailing, but twenty grains, not less, thrice daily, will exert a decided control over the excessive sexual propensity.

The bromides also restrain spermatorrhœa. Their employment should be supplemented by cold sponging of the scrotum and perinæum, and the suspension of the testicles in cold water for some minutes night and morning. Seminal emissions are generally excited by dreams, which may often be avoided by abstaining from suppers, and sleeping on a hard mattress. Dr. George Bird has pointed out that seminal emissions occur from undue indulgence in bed, the emissions taking place almost always in the early morning, during the second sleep. He recommends, therefore, that the patient should be roused er six or seven hours' sleep, and should never give in to a second ep. The observance of these simple means will often cure this erwise troublesome affection. Dr. Hardman, of Blackpool, tells me at he has cured some obstinate cases of spermatorrhœa by directing e patient to empty the bladder on waking from the first deep sleep.

The bromides are useful in priapism.

In sea-sickness they are sometimes beneficial. They should be ven three times a day, and should be commenced some days before iling. Friedreich gives 15–30 grains of bromide of potassium, daily, the vomiting of pregnancy.

The bromides prove useful in allaying various forms of hyperæsthesia; netimes they ease the severe pain of chronic arthritis.

Dr. Da Costa finds that bromide of potassium lessens, or even vents, many of the disagreeable symptoms of opium, such as giddis, confusion of mind, fainting, headache, and sickness. It manifests s effect over morphia and codeia, less than over laudanum. A large e—20 grains—of the bromide must be given half an hour before, two hours after, the taking of the laudanum. Even larger doses y be necessary, and in certain cases he has given 40 to 60 grains e hours before the administration of the opium. Among the opium ptoms, Da Costa says that the bromide exerts most control over the tness; he maintains also that the bromide heightens the "anodyne ypnotic effects of opium."

ike hydrobromic acid, bromides prevent the deafness and buzzing sed by salicylate of soda or quinine; ten to fifteen grains of bromide st be added to each dose of either drug.

f the medicine is continued for a long time, as is sometimes uired in the treatment of epilepsy, the physiological effects of the g become apparent. "Diminished sensibility, followed by come anæsthesia of the soft palate, uvula, and upper part of the rynx, is the first symptom that the patient is getting under the uence of the drug. The sexual organs are amongst the first to influenced, for there is soon produced failure of sexual vigour, l, after a time, marked diminution of the sexual appetite itself." zire.) These effects upon the sexual functions vary greatly; in ne cases the bromide producing only moderate diminution, in others, re marked, though temporary, impairment of their activity. On continuing the remedy the sexual organs regain their lost power.

Another frequent result of the prolonged administration of the omide is an eruption, generally acneform, occurring most on the ce and back, though it may affect a larger extent of surface.[1] These ots do not generally suppurate, nor do they scar. They may hower become true boils, and these boils may sometimes form large cers with conical scabs, looking like rupia. Dr. Weir Mitchell narrates a case of this kind. He found that the bromides of potassium sodium, ammonium and lithium produced these ulcers. He also tried the bromides of calcium and magnesium, and bromine itself; but as these last preparations failed to control the epileptic fits, they were not given long enough to determine if they also would produce these rupoid ulcers. Echeverria finds that five to ten minims of the liquor arsenicalis, given with the bromide, will prevent the eruption, and the experience of the Epileptic Hospital confirms him; I have seen cases where the rash has been quickly removed and subsequently prevented by arsenic. I have also found that iodide of sulphur ointment, frequently applied, lessens considerably the quantity and th severity of these eruptions. The efficacy of the remedy bears proportion to the amount of acne produced. The bromide excit sometimes, it is said, eczema, and spots like erythema nodosum.

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[1] Strangely, Dr. Cholmeley reports the cure of some obstinate cases of acne y moderate doses of bromide of *potassium.*

Professor Dühring, in addition to acneform pustules, enumerat brownish discoloration of the skin, simple papular eruptions, conflue or molluscoid acne, maculo-papules, carbuncular acne, and bullæ rupia as the occasional consequences of bromides. Undue administ tion of the bromides renders a patient low-spirited, easily fatigu and unfitted for work, and lessens the brain's functional activi sometimes to a very marked extent. It produces this effect, Brunton remarks, without disturbing the relation of one part of brain to another, *i.e.*, without disturbing the cerebral balance. these symptoms soon subside on the suspension of the medicine.

Acne, and the other evidences of bromism, rarely occur, howe large the dosage, unless more than one dose is taken daily.

M. Rabuteau says that bromide of potassium may be detected the urine and saliva twenty days after the administration of a dos fifteen grains. Dr. Amory could not find it more than forty-eigh fifty-two hours after the administration of a single dose; but after drug had been taken several days, and then discontinued, the evide of it persisted for a longer time. Elimination by the urine is rapid than absorption by the stomach. Traces appear in the u in ten minutes. Elimination is most active during the first eigh ten hours, and in less than twenty-four hours the greater part have disappeared. It can be detected in the milk and sweat.

Bromide of potassium is conveniently administered in beer or m The liquid extract of liquorice is useful to cover its saline taste mixtures.

As in the case of iodide of potassium, the spirits of nitrous et would be incompatible with a bromide unless the spirits had b previously neutralized.

A THEORY CONCERNING THE "TOPICAL" ACTION OF ACIDS AND ALKALIES ON SECRETION

PREVIOUS to the consideration of acids and alkalies in detail, I wish to note their mode of action on some of the secretions of the body, and to draw attention to a theory which I think explains this action; this theory, moreover, will serve as a useful guide to the correct employment of acids and alkalies in disease.

Acids are powerful stimulants of the alkaline salivary secretion: in this action the impression of the acid upon the mucous membrane is conducted up to the spinal cord, and thence reflected through the cerebro-spinal nerves down to the salivary glands; if these nerves are divided, acids cease to augment the salivary secretion.

Repeated and careful experiments have established the fact that dilute acids taken into the stomach check its secretion; alkalies, on the other hand, powerfully excite the secretion of the gastric juice.

From these facts the more general law is inferred, that acids, applied topically, check the production of acid secretions from glands, while they increase the flow of alkaline secretions; the very reverse being the case with alkalies, for alkalies applied to the orifices of glands which secrete acid increase their secreting power, but applied in a corresponding way to glands having an alkaline secretion they lessen or check this secretion.

In support of this generalization which I have ventured to propose, I will now adduce some practical instances of the efficient therapeutic employment of acids and alkalies.

Acids are useful to allay thirst, by promoting, through their topical action on the mucous membrane, the secretion of the alkaline saliva.

Acids given shortly before a meal generally check stomach acidity.

Alkalies given shortly before a meal increase the secretion of the acid gastric juice, and so promote digestion.

A weak alkaline lotion is often useful in the weeping stage of eczema, by checking the alkaline watery exudation.

A weak alkaline injection is efficacious in that form of leucorrhœa depending on a too abundant secretion from the glands of the os uteri, the secretion of that part being alkaline.

Some of these instances will be referred to again in greater detail in their proper place in this volume.

SULPHURIC, HYDROCHLORIC, NITRIC, PHOSPHORIC AND ACETIC ACIDS

THE members of this group are powerful acids, and accordingly have a strong affinity for alkalies and bases generally. Some, *e.g.* sulphuric acid and phosphoric acid, when in concentration, absorb water with avidity. All possess high diffusion-power, and so pass readily through animal membranes and textures. These are the properties which explain most of their actions upon the living body.

These acids, when concentrated, produce decided changes in the skin by their affinity for the bases and water of the tissues, as well as in a lesser degree for the organic substances themselves. Their great diffusion-power enables them to penetrate readily and deeply beneath the surface, exerting the while a continuous destructive action, till they are sufficiently diluted with water or neutralized by the bases of the animal structures. From their great affinity for water, sulphuric and phosphoric acids are especially energetic; they withdraw this element from the tissues, and thus effect their complete destruction. In adequate quantity they will destroy to a considerable depth, and produce a brown or black eschar.

The remaining members of this group, owing to their feeble affinity for water, destroy the tissues less extensively, and their action is hence much more superficial.

Sulphuric acid and phosphoric acid are never used undiluted, on account of their severe corrosive action upon the tissues. On the other hand, nitric acid is frequently employed in full strength to destroy the surface of foul and unhealthy sloughs and ulcers, and, in virtue of a property of which we shall shortly speak, to change an unhealthy and indolent sore into one more healthy and prone to heal. It is thus frequently employed in cases of soft chancre, indolent and broken bubo, cancrum oris, etc.; in the latter case it is employed in the hope also of arresting the spreading of the gangrene.

Strong nitric acid is an efficient remedy for internal piles, two or at most three applications to the enlarged and dilated vessel being sufficient; it should not be applied to the whole surface, but only at one or two points. It is useful also in granular or ulcerated piles. It produces little or no pain. A superficial slough follows, and after the separation of the slough the contraction of the sore diminishes the size of the pile.

Nitric, hydrochloric, and especially acetic acids, may produce some vesication. Nitric acid colours the skin characteristically yellow.

No treatment is easier or more speedy or certain in its action than the application of strong acetic acid to ringworm of any part of the body except the scalp.

Strong acetic acid, and nitric acid somewhat diluted, are frequently applied to warts to destroy them. But although almost any of the acids are effectual in removing, often completely, the warty growths, yet sometimes a fresh and abundant crop springs up in the neighbourhood of those undergoing treatment. Dr. George Bird finds that glacial acetic acid is very effectual for the above-mentioned purpose. In the case of small syphilitic warts and condylomata, a wash of diluted nitric acid—a drachm or two of the dilute acid, to a pint of water, is sufficient—if kept constantly applied, will surely and painlessly disperse them.

The members of this group are more generally employed externally, mixed with water. Although diluted, they still excite a beneficial irritation or rather stimulation, and they may be used for this purpose as lotions in urticaria, to control the very troublesome itching, or even prevent the formation of weals; in some cases they appear to be mainly instrumental in curing this disease.

Acids, especially nitric acid and hydrochloric acid, are less frequently employed as baths than formerly, yet, beyond doubt, they do, in this form, exert a very powerful influence on the skin. A general bath, containing two to eight ounces of the strong nitric or hydrochloric acid diffused through it, is a very active exciter of a torpid skin. Whether these baths have any effect on the other organs of the body is at present quite unknown, no experiment having been made to settle this question. It is highly probable, however, that in common with other materials dissolved in baths, these acids remain unabsorbed by the skin, and that any change in the deep parts of the body resulting from medicated baths must be ascribed to the direct local action of the materials on the skin itself. Sponging the surface of the body with water, weakly acidulated with acids, will, in some cases, effectually control profuse sweating.

They act more powerfully as stimulants to the skin when it is stripped of its cuticle, and in this way nitric acid is frequently used with much benefit as a lotion in indolent and painful ulcers.

Applied to the denuded dermis, or to mucous membranes, etc., acids act also as astringents, precipitating the albumen and causing a direct condensation of the tissues; this they do perhaps by removing part of the base, by combination with which the albuminous substances were held in the soluble form as alkali-albumen.

By virtue of their astringency they check profuse secretions from unhealthy sores. Nitric acid is most to be preferred in such cases Nitric acid is used clinically as a test for albumen in solution.

Again, by virtue of astringency, these acids when diluted check, very effectually, bleeding from the smaller vessels and capillaries, constringing the tissues, exciting the muscular coats of the arteries to contract, and coagulating the blood in the ends of the wounded vessels, and so plugging them. Vinegar, always at hand, will check bleeding from leech-bites, piles, cuts, etc.; the vinegar should be diluted.

A drachm or half a drachm of the dilute nitric acid to half a pint of water is an excellent lotion for bleeding piles, staying the hæmorrhage, constringing the swollen and inflamed tumour, and easing the heavy, tensive, wearing pain.

Acids are, in part, neutralized by the alkaline secretion from the salivary glands, while any acid remaining free precipitates the mu coating the mucous membrane, and if in sufficient quantity, att the mucous membrane itself. They act beneficially as astringe when the lining membrane of the mouth is relaxed or ulcerated, as ulcerative stomatitis, salivation, aphthæ, etc.; but other astringe are preferable if a merely local action is required.

Acids are applied to the throat for the same purpose as to the mo Undiluted nitric acid acts beneficially as a topical application to foul sloughs or ulcers which occur in the course of scarlet feve other diseases.

Bretonneau warmly recommended the application of strong hy chloric acid to the throat in diphtheria. The acid may be undiluted or mixed with an equal part of honey which gives mixture consistence, and makes it cling about the parts on whic is painted. It was to be painted only on those parts attacked by diphtheritic inflammation, and not on the neighbouring healthy tis in which it would excite active inflammation, for the reason that inflamed parts are very liable to become affected by the diphth process.

Lactic acid was at one time much used as a topical applicati dissolve diphtheritic membrane. It may be employed as a spra this purpose, in the strength of one half to one drachm of the acid t ounce of water, or this solution may be mopped on the diseased It must be used every hour or oftener.

The above acids, with others such as citric, tartaric, etc., que thirst of fever patients much more effectually than simple especially if the drink is made rather bitter with some agre tasting substance, as orange-peel or cascarilla. Much of the tr some thirst of fevers is due solely to dryness of the mouth and t This disagreeable local sensation of thirst is very liable to lead patients to drink more water than is really good for them, with ing loss of appetite, indigestion, and even diarrhœa and flat (*Vide* Water.)

The action of acids in lessening thirst has already been exp in the chapter on the topical action of acids and alkalies up secretions. As we have seen, acids probably increase alkaline tions, and thus the acid drinks used by fever patients prom increased secretion of the salivary glands. Bitters, as we sha sently see, possess the same power; hence, acid and bitter acting on the salivary glands keep the mouth and throat comfo moist and quench the thirst. By lessening the harassing thirs comfort the patient, quell irritability of temper, favour sleep, the pulse, and diminish the heat of the body, and in this way febrifuges. Organic acids are employed largely in fevers.

Nitric acid, in small medicinal doses, may be given with when the mouth shows a reddened, inflamed, and glazed membrane, a condition frequently met with in irritable states of the digestive organs; also when the throat presents similar appearances.

The albuminous constituents of food are digested and rendered soluble in part by the agency of acids, but all acids are not equally efficient. Hydrochloric acid has the advantage over sulphuric and nitric acids in this respect; indeed, sulphuric acid hinders rather than promotes digestion by precipitating the albumens in an insoluble form. The action of acids on nitrogenous substances is completed by the help of pepsin.

In scanty secretion of gastric juice dilute hydrochloric acid may be employed to assist digestion. The considerations developed in the section on the topical action of acids and alkalies on the secretions render it obvious that the time of administration, in respect to meals, is all-important. If given before a meal, acids check the secretion of the acid gastric juice, and so hinder, instead of aiding, digestion. Accordingly, when the secretion is scanty, the acid must be given after the meal, *i.e.* when the secretion from the glands of the stomach is completed; the additional acid will then assist the action of that secreted naturally, but too scantily. In many cases of atonic dyspepsia alkalies are preferable to acids, but they must, of course, be given a short time before a meal; certain cases occur, however, where acids answer better than alkalies. In such cases the mucous membrane has been, possibly, considerably damaged by excesses in eating or drinking, and such degeneration of the glands of the stomach caused, that no stimulant action is able to excite a sufficient flow of gastric juice.

Acids, as we have seen, will check or lessen the secretion of gastric juice. Now in many stomach diseases, in some cases probably from sympathy with distant organs, the follicles pour into the stomach an excess of acid, which undue secretion may be treated by the administration of acids shortly before food. Again, acidity of the stomach is often due not so much to hypersecretion as to excessive or irregular fermentation, leading up to the production of a large quantity of various acids, such as acetic, butyric, and lactic; this excessive or irregular acid fermentation will itself be checked by acids. We have, therefore, in the acids themselves remedies which are able to control and check the two chief causes of acidity of the stomach, and so relieve the distressing symptoms which are caused by it. Their efficacy holds without reference to the primary cause, whether due, for instance, to pregnancy,[1] uterine disease, calculus of the kidneys, the various indigestions, or to more serious diseases of the stomach.

Practical men, indeed, know well that the administration of an acid will remove acid eructations, heartburn, and the sense of discomfort at the chest and epigastrium, arising from excess of acid in the stomach. Hydrochloric, nitric, or lactic acid is generally preferred, and small medicinal doses, separately or combined, are ordinarily sufficient, provided the prescribed rules are obeyed.

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[1] Two or three drops of tincture of nux vomica taken a few minutes before meals will often obviate the acidity of pregnancy. Sometimes ipecacuanha will control it.

Patients are sometimes greatly annoyed by eructations of an offensive gas, with the odour and flavour of rotten eggs—a gas evidently consisting largely of sulphuretted hydrogen. The late Dr. Day, of St. Andrews, noticed that in such cases the urine was loaded with oxalic acid, and in their treatment he strongly recommended the employment of mineral acids. Dyspeptics with oxalic acid in the urine, and who suffer from great mental depression, but are free from sulphuretted hydrogen eructations, also find much benefit from nitric acid treatment.

In the treatment of dyspepsias a clue to the administration of acids on the one hand, or of alkalies on the other, may sometimes be obtained by testing the reaction of the fluids rejected from the stomach. Not unfrequently, soon after a meal, a fluid regurgitates almost unconsciously into the mouth, sometimes so strongly acid that it sets the patient's teeth on edge. The exhibition of nitric or hydrochloric acid shortly before each meal almost immediately removes this acid pyrosis. But sometimes the fluid which regurgitates has an alkaline reaction, and the pyrosis is often accompanied by much distress, with nausea, and vomiting of the just-eaten food; the rejected contents of the stomach generally show a strong alkaline reaction. Here an acid immediately after a meal relieves the nausea, the vomiting, and all distressing symptoms. On theoretical grounds, we should expect that an alkali, administered shortly before food, would yield even more satisfactory results, but in such cases I have had no experience of alkalies.

It need hardly be stated that acids given soon after a meal to patients troubled with acidity and heartburn greatly aggravate the suffering. It is adding fuel to the fire. If continued too long, the administration of these remedies before meals may not only check undue acidity of the stomach, but even go beyond this, and by lessening the secretion of gastric juice to an undue extent, actually induce the very opposite condition to that for which, in the first instance they were employed. Those who have watched the action of acids on the stomach well know that if too long continued the improvement first noticed ceases by degrees, then fresh symptoms arise, which strangely enough, are relieved by the very opposite treatment to tha which had previously benefited.

Too long a course of acids excites catarrhal inflammation of th mucous coat of the stomach and intestines, often accompanied b diarrhœa, and sometimes followed by general wasting. This damaging action of acids explains the occasional thinning effects of vinega when taken for a long time by fat people. With this object in vie vinegar is sometimes taken, surreptitiously, in wineglassfuls several times a day to reduce obesity. This foolish practice, which cannot be too strongly condemned, may thin the patient, but it does so at the risk of serious injury to the body. Obesity can be reduced by harmless means.

These acids are inoperative to check the growth of sarcinæ in the stomach, and they often fail even to check the acidity accompanying these organisms. Though not pathognomonic, sarcinæ are frequently present in dilatation of the stomach, a condition in itself difficult to treat.

It is a common practice with drunken soldiers to drink a wineglassful of vinegar in a tumbler of water, to cut short intoxication; whether it does sober a drunkard is not certain, but it seems to steady a tipsy soldier sufficiently to enable him to pass muster on presenting himself at barracks.

By virtue of their astringent action, and their power of coagulating the blood, acids are useful in bleeding from the stomach. Sulphuric acid is generally preferred to the other members of this group. But many other astringents which we possess are surer than the acids.

Dilute acids are used as antidotes in poisoning by alkalies. Owing to their high diffusion-power, these acids pass readily from the stomach into the blood. That part which escapes absorption and passes into the intestines must, to a great extent, become neutralized by the alkalies of the bile and pancreatic juice, and therefore, the acids as such, can, by direct contact, affect to a very small extent only the middle and lower part of the intestinal tract. But inasmuch as they become neutralized at the expense of the bile, some of the biliary and weaker acids will be set free, and so in some degree the acidity of the contents of the intestines will be increased.

It has been shown experimentally that acids applied to the mucous membrane of the duodenum cause an increased flow of bile, which increase has been attributed to a mere contraction of the gall bladder and bile ducts, effected, in some way, mechanically or reflexly, by the entry of the acid contents of the stomach into the duodenum. I suggest that part at least of this augmented flow is due to an increased secretion of the liver, not to a simple emptying of the bile reservoirs, and that the increased secretion is brought about in accordance with the alkali-acid theory which I have propounded (*see* Section 7); the acid contents of the duodenum stimulating the secretion of the alkaline bile, and the still more alkaline pancreatic juice.

It has long been held that nitric acid acts in some way beneficially on long-standing diseases of the liver, such as chronic congestion and cirrhosis, and that it will augment the flow of bile after the liver has struck work from the excessive use of mercury.

From his experiments on fasting dogs Rutherford concludes that nitro-hydrochloric acid is a hepatic stimulant, thus confirming the conclusions founded on clinical experience.

There can be no doubt that sulphuric acid is highly useful in checking summer and choleraic diarrhœas, although, as it is generally administered with opium and warm carminatives, it is difficult to distribute to each remedy its exact share of merit. Its mode of action is less obvious than its efficacy. It may control the formation of acid in the intestines, or it may act as an astringent, and so check the diarrhœa. If it acts as an astringent, then, since the acid is soon neutralized and converted into a sulphate in the upper part of the small intestine, thereby losing its astringency at once, its influence on the lower and middle parts of the small intestine must be exerted through a nervous sympathy existing between the different parts of this canal. Sulphuric acid is often considered to act capriciously, giving rise to much uncertainty in its administration, but the lack of uniformity in its results can be accounted for, in many instances, by the dose: a small medicinal dose often benefiting, whilst a full one, by increasing the acidity of the canal, may even aggravate the diarrhœa. Dr. Neligan, and other authorities, recommend sulphuric acid in chronic diarrhœa, and in the "profuse sweating and colliquative diarrhœa of hectic."

In small medicinal doses nitric acid is of great use in many diarrhœas; it often acts admirably in the straining diarrhœa of children,[1] but when the motions are green, curdled, and mixed with mucus, other remedies are to be preferred to acids. Nitric acid may sometimes be used with great benefit, especially when given with pepsin, in that chronic diarrhœa of children marked by pale and pasty motions smelling sour and disagreeable.

On the other hand acids are reputed to heighten the action of purgative medicines, and for this purpose sulphuric acid is sometimes employed: sulphuric acid is thus given to increase the purgative effect of extract of aloes. Acids further are often added to purgative salts, such as Epsom salt, when an additional tonic and bracing action on the mucous membrane is desired, as in many cases of anæmia in young women.

If not already neutralized on their passage into the blood, these acids must at once become so after their entry, and it would appear that henceforth their history must be that of the salts they form. Yet the received teaching of the action of these acids on the organs of the body is so different from that of any of their salts that the behaviour of the acids must be spoken of separately.

On combining with the alkalies of the blood, the acids must set free some weaker acids, and so to a slight extent lessen the alkalinity of that fluid, as is evidenced by the increased acid reaction of the urine following the use of mineral acids.[1] What further effects they may have on the blood is at present quite unknown. They are reputed to be tonic and bracing to the body generally, but the improvement in the general health may more safely be attributed to their action on the intestinal canal. Still, they do produce certain important changes in the fluids and solids of the body, since in the absence of lime-juice or fresh vegetables, acids, especially vinegar, act as preventives of scurvy.

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[1] The green colour of the motions indicates in itself an increased acidity of the intestinal contents.

The functions of the body are supported by an alkaline or neutral blood alone. Slight acidity is at once destructive of all function. This is well seen in experiments with the detached frog's heart. When supplied with blood, or with saline solution to which a physiological quantity of potash and lime salts has been added, and a small quantity of acid is then added, enough only to cause the faintest acid reaction, the heart soon ceases to beat spontaneously, and in a little while all contractility will be lost, the ventricle refusing to contract when stimulated by a strong faradic shock. [I find that a ventricle will beat for hours when fed by a neutral fluid, composed of saline solution containing one ten-thousandth part of potassium chloride and a minute dose of calcium chloride.] It is obvious, then, that though alkali in the blood is not necessary for function, yet, as with every performance of function by the organs acid is formed, certainly this is the case for muscular contraction, the neutral fluid would soon become acid, and function be destroyed; this is obviated by the alkali of the blood which neutralizing the acid prevents its depressing effect on the tissues.

Acids seem sometimes to abate the rapidity of the pulse in fevers, a result not due probably to the direct action of the acid on the heart or nervous centres, but rather to the relief arising from diminished thirst.

Hydrochloric acid is frequently given in fevers, especially of a typhoid character.

Dr. Rees recommends large doses of lime-juice, to the extent of eight ounces daily, in acute rheumatism. Dr. Inman also speaks highly of this treatment, and observes that neither tartaric nor citric acids nor lemon-juice can be substituted for lime-juice.

Nitric acid is recommended in secondary syphilis. It has been said sometimes to induce salivation; if so, this may have been due to the direct action of the acid upon the mucous membrane of the mouth increasing the alkaline secretion of the salivary glands.

Sulphuric acid, especially in conjunction with sulphate of zinc, checks the profuse sweating of phthisis and other exhausting diseases. Dr. Graves ascribed a similar action to vinegar, and often used this favourite receipt: Distilled vinegar ℥ij., Laurel water ʒij., Syrup ʒvj.,

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[1] The power of acids to increase the acidity of the urine is difficult of demonstration.

Water ℥v. Of this one ounce or two ounces was to be taken every third or fourth hour. Sulphuric acid is supposed to check bleeding from the lungs or womb,[1] *i.e.*, to exert an astringent action upon organs which it can only reach after absorption into the circulation. It is difficult, indeed, to understand how an ordinary dose of sulphuric acid can exercise such an influence after becoming so greatly diluted by admixture with the blood, and the difficulty is enhanced by the consideration that these acids, either before or immediately after their entrance into the circulation, will have been converted into neutral salts, viz., sulphates, nitrates, and phosphates. Whatever influence, however, is exerted *directly*, *i.e.* topically, on distant organs must be effected by these same salts ; yet we cannot ascribe to any of the salts of these acids properties similar to those attributed to the acids themselves. We must not, however, overlook the possibility of a reflex action upon the deep organs, by virtue of a stimulation, exerted by the acids, as such, upon the alimentary tract.

In such questions experience is a surer guide than speculation. Nor may we forget the subtle influence of even small doses on distant organs of the body, which is strikingly exemplified by the effect of medicines taken by the mother upon the infant she is nursing, an effect which can only reach the child directly through the mother's milk; thus it is recognised that acids taken for some time induce in the child sickness, diarrhœa, and colicky pains.

Many recommend acids in chronic bronchitis, and find that they lessen the secretion. Röhrig, in his experiments on animals, found that acids lessened the secretion from the tracheal mucous membrane, but very probably the value of acids in such cases will be in chief part explained by the tonic influence of acids upon the whole body.

Phosphoric and lactic acids are employed in diabetes. Griesinger, who has carefully studied the action of phosphoric acid, considers that it does more harm than good. He employed the acid to the extent of an ounce daily, and found that this dose increased the sugar.

Since the members of this group augment the acidity of the urine, it has been proposed to dissolve phosphatic calculi by artificially acidifying the urine by their administration; but these acids influence only very slightly the acidity of urine, and they would have to be taken for a prolonged period before they could materially diminish the bulk of a stone; moreover, there would remain the insuperable objection that this method of treating calculi would seriously damage the mucous membrane of the stomach and intestines.

The injection into the bladder of nitric acid, sufficiently diluted, has been employed with success by some eminent surgeons, and is far more effectual treatment for phosphatic calculi. The experiments of Sir W. Roberts on the solvent power of dilute solutions of this acid on calculi, after their removal from the body, led him to the conviction that this treatment is worthy of a much wider application than it at present receives; moreover, by neutralizing the urine if alkaline, and so preventing its decomposition, nitric acid injections will protect the mucous membrane of the bladder from the irritation of the ammoniacal urine.

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[1] Sucking the juice of one or two lemons is a domestic remedy for excessive menstrual flow.

The further influence of sulphuric, nitric, and hydrochloric acids on the urine is unknown. Of the influence of acetic and phosphoric acids we shall speak in another place.

It should be remembered that phosphoric acid may possess many other properties than those already specified, but these will be referred to in speaking of the phosphates, for it is in this form that phosphoric acid exists in the blood, and manifests many of its beneficial effects on the diseased body; we may, however, mention that phosphoric acid is often prescribed in nervous and general debility.

Taken internally for any length of time the acids are apt to damage the teeth, dissolving the earthy constituents. They are therefore best taken through a quill, a glass tube, or a reed; it is also well to rinse the mouth out with plain water after the dose.

SULPHUROUS ACID, SULPHITES, HYPOSULPHITES

SULPHUROUS acid is generally considered to be a potent poison to the lower forms of life, and is commonly used as a deodorizer and disinfectant. It is a deodorizer by virtue of its power to arrest putrefaction, and hence it may be used to prevent bad smells, but it has been said to possess little or no power of decomposing offensive gases, and therefore to be of little service in destroying foul odours. This however is an over-statement, for it is able to decompose sulphuretted hydrogen with precipitation of sulphur. It arrests fermentation by destroying the minute organisms which determine this process, and it is supposed to disinfect in like manner by destroying the micro-organisms which propagate contagious diseases. Koch's experiments, however, satisfy him that sulphurous acid, gaseous or in watery solution, is not a disinfectant of much practical value, and has little power over bacterial life, in particular over the spores of bacilli.

It must be borne in mind that sulphurous acid corrodes metals, so that, when used as a disinfectant, these should be protected by a covering of some greasy substance; it also bleaches vegetable colours, and is absorbed by cloth and leather. (Russell, *Quain's Dictionary*.) In fumigating a room, sufficient sulphur, about one pound to every thousand cubic feet of space, should be burned, and the escape of the gas by the chimney, windows, and crevices of the doors, should be prevented.[1] It is better to repeat this process three or four times at intervals of twenty-four hours. To disinfect a bed, Mr. Startin recommends that a warming-pan containing live coals sprinkled with sulphur should be put between the clothes till the sulphur is consumed. A damp napkin held before the mouth will prevent the sulphurous acid from irritating the lungs. It is far better, however, to submit the bedding, etc., which cannot be boiled, to steam at a temperature between 250° and 300° in a disinfecting chamber or oven; the exposure should last two or three hours.

Baxter finds that sulphurous acid is more destructive of the vaccine virus than either chlorine or carbolic acid.

One of the quickest ways of curing itch is to immerse the patient, leaving the head free, in a gaseous bath of sulphurous acid, made by burning 12 drachms of sulphur in a suitable apparatus. Whilst in the bath, the patient's clothes should be baked; in this way, within half an hour, the patient is cured of the itch, and is made free from the risk of re-infection.

The acid will cure tinea versicolor, also known as pityriasis versicolor, by destroying the parasite on which the disease depends. For this purpose the aqueous solution of the pharmacopœial acid, mixed with an equal quantity of glycerine, may be used, the surface affected being freely mopped with this. Warm baths should also be employed to assist the acid by removing the layers of cuticle covering in the parasite. The pharmacopœial acid is useful also in favus, and in tinea tonsurans, but when these affections are unusually obstinate its action should be assisted by epilation.

Applied strong or diluted, in various proportions, the solution of the B.P. speedily removes thrush.

Dr. Dewar, of Kirkaldy, has drawn attention to the beneficial action of sulphurous acid in various diseases, and many of his statements have been confirmed by subsequent observers.

Dr. Dewar applies the sulphurous acid in three ways,—as a solution, by fumigation, and by the spray-producer. A solution of the acid, or the fumigation, will, he says, speedily cure chilblains and chapped hands. Wounds and sore nipples he treats with the solution, kept constantly applied, either in full strength or diluted. The same treatment, he employs, also, to prevent or quickly dissipate the effects of bruises. Equal parts of the acid of the Pharmacopœia, and of water or glycerine, will, he states, at once ease the burning, and prevent the spread of erysipelas.

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[1] Cyrus Edson uses 3 lbs. of sulphur to every thousand cubic feet. We may remind that Koch recommends the use of chlorine in preference to sulphur. (*See* Chlorine.) The destructive action of chlorine upon textures, etc., is, however, far more serious.

According to the same authority, many of the respiratory tract diseases are amenable to sulphurous acid; amongst others, cold in the head, influenza, tonsilitis, malignant sore-throat (scarlatinal or otherwise), laryngitis, chronic bronchitis, chronic phthisis, asthma, croup and clergyman's hoarseness; he also recommends it as of value in typhoid fever.[1]

The acid may be applied to the throat by fumigation, the gas being breathed, or by inhalation; for this purpose a few drops should be added to hot water, and the steam inhaled. The acid may also be applied by a camel-hair brush, or by the spray-producer.

It may be carried into the lungs by fumigation, inhalation, or by the spray. If properly and carefully employed, the pharmacopœial acid excites scarcely any irritation or annoyance. The application of sulphurous acid gas may be conducted in the following way:—

"Put a few red-hot cinders into a kitchen shovel, set this upon a wooden stool, and then sprinkle flowers of sulphur from time to time till the room is not inconveniently filled with smoke."

The spray may be applied by a vaporizer now in common use, furnished with vulcanite tubes constructed upon Dr. Dewar's plan: there are many available and convenient forms of spray apparatus now to be had; the tubes should be of vulcanite or glass. For a child the instrument should be held about three feet from the mouth, and the fine spray of the undiluted B.P. solution, if it can be borne, should be inhaled, and the process repeated according to circumstances. In an acute attack of diphtheria, with no time to lose, it may be repeated hourly, or even oftener. Sulphurous acid may also be used as a gargle or wash.

In applying the spray to adults Dr. Dewar directs the operator "to hold the nozzle of the instrument about six inches from the patient's mouth, and administer three or four whiffs to begin with; then, after an interval, during which a cough or two is given, the process is repeated, about twenty squeezes, in all, which represents the injection of from forty to sixty minims of acid. The acid should be pure."

For the relief of rheumatism and gout, besides the fumigation, Dr. Dewar advises that the bed-clothes should be exposed to the strong fumes, and then spread over the patient, who after sweating and sleeping wakes much relieved.

Dr. Lawson speaks highly of sulphurous acid as a remedy for pyrosis; indeed, he says it never fails to be of service, and in my experience it seldom does fail. Ten to fifteen minims in water should be taken ten minutes before each meal. The sulphite he finds useless.

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[1] Of late typhoid fever has been treated to a considerable extent by the internal administration of antiseptics. The results, however, have not been very striking.

Sulphurous acid, in doses of five to ten minims, often prevents flatulence produced by fermentation, and is especially useful when the gas is abundant. It is more efficient than sulphites and hyposulphites. Sulphites and hyposulphites have been employed to destroy sarcinæ and torulæ in the stomach.

Sulphurous acid is useful as a wash or gargle in diphtheria.

Sulphites, administered by the mouth, will, it is said, prevent decomposition and putrefaction of the urine in the bladder.

It is said that hyposulphite of soda, in fifteen to twenty-grain dose, every two hours, will cure intermittent fever, but more careful observers do not corroborate this statement.

It was at one time said to be useful in the acute specific fevers.

Sulphurous acid in aqueous solution is liable to suffer oxidation to sulphuric acid, on keeping. This must be guarded against by ordering it to be freshly prepared. Its specific action as a deoxydizant is lost when it becomes sulphuric acid.

CHROMIC ACID

CHROMIC acid coagulates albumen, is a powerful oxidizant of organic matter, destroys the lower organisms, and decomposes ammonia and sulphuretted hydrogen: thus it acts as a disinfectant and deodorizer.

Chromic acid was first used as an escharotic by Mr. John Marshall, who employed it to remove warty growths from the nose, genital organs, or elsewhere. Immediately after touching the parts with chromic acid Mr. Marshall applies lead lotion, "which restrains the subsequent inflammation, relieves the subsequent soreness, and does not in any way neutralize or retard the rapid effects of this apparently useful escharotic." He uses a solution containing a hundred grains of crystallized chromic acid in an ounce of water. "The solution is best applied by the aid of a pointed glass rod, or when a large quantity is needed, by means of a small glass tube, drawn to a point. Only so much should be applied as will saturate the diseased growth, avoiding the surrounding healthy mucous membrane, for, though the solution is not sufficiently powerful as an escharotic to destroy or even vesicate the mucous membrane, it may give rise to an unnecessary amount of inflammation." "Any superfluous acid may be removed by a piece of wet lint. The first effect of its application to the warts is to produce a slight smarting pain. If, however, any ulcerated surface be touched, the pain is of a burning character, more lasting, but not so acute and intolerable as that caused by nitrate of silver, or by nitric acid, with or without arsenious acid. Under its influence, the morbid growths rapidly waste, in some cases being hrown off altogether, and in others undergoing a partial, though ident, diminution in size. The best immediate dressing is dry lint, afterwards the part may be washed with lead lotion, and dressed with lint moistened in the same." "In most cases one application suffices, the cure being completed in from four to eight days. In severe cases, where the warts are large, repeated applications are necessary." Mr. Marshall further states that "chromic acid solution neither burns nor stains linen; it all washes out."

For caustic purposes chromic acid is sometimes used in greater strength, viz., in the form of the liquid which results from the addition of just sufficient water to make the crystals liquefy. The mode of application is just the same. Care must be taken to restrict the application to the diseased part, and not to use more of the acid than suffices for this purpose. Death has happened more than once from too free an application. (*See* Wood.)

Internally, chromic acid acts as a violent corrosive.

We must caution against the mixing of chromic acid and glycerine, except with great care, else there is risk of explosive chemical action.

BORIC OR BORACIC ACID

UNLIKE many disinfectants and antiseptics, boric acid does not either oxidize or deoxidize: in this respect it contrasts with the chlorine, bromine, and iodine group, and with chromic acid, sulphurous acid, etc. Though not destructive to all the lower forms of life, boric acid is largely used as an antiseptic dressing for wounds, and it is employed chiefly as a lotion or ointment. The lotion is composed of one part of boracic acid in twenty of hot water, which on cooling yields a saturated solution. The ointment is now largely used for burns, eczema, etc. The lotion is often useful in pruritus pudendi, eczema of the vulva, some forms of leucorrhœa, and in vaginitis. A pint of a saturated solution of boracic acid used daily to flush the nose is very useful in chronic ozœna. The saturated solution is also useful to wash out abscesses, empyæmas, etc. Cyon finds that it has very little physiological action, and is less irritating than many other substances used for the purpose.

Though this is true, and that boric lotions and dressings of all kinds are extensively used, with excellent results, yet occasionally symptoms of poisoning arise, and occasionally fatal results. The symptoms have included general and circulatory depression, often with the development of an erythematous rash, especially of the lower limbs, sometimes of ecchymoses—also in some cases symptoms of gastric irritation.

The late Dr. Simpson, of Highgate, told me that boracic acid dissolved in glycerine was a very useful local application in diphtheria.

In a letter to me he says:—"During the last epidemic of diphtheria I have used boracic acid dissolved in glycerine (in a water bath) of the strength of 1 in 30, applied by means of a brush to the throat, every two hours day and night, until all traces of membrane had disappeared. The patches took on a white colour, with no offensive odour emanating, and in the course probably of forty-eight hours, and often much earlier, no trace of membrane was visible. Dr. Cossar Ewart and I found by experiment that bacteria present in the membrane so treated could not be propagated. Children do not dislike the taste. I find boracic acid, of strength 1 in 50, of service also in stomatitis."

The value of this local treatment of diphtheria we can fully endorse. It gives most excellent results. We should however recommend a saturated solution of boric acid in glycerine, about 1 in 5, in preference to the above strength. An essential of this and indeed of all local applications in diphtheria is frequency—this should be every hour during the day, every two hours at night, at least during the first 24 or possibly 48 hours.

An ointment composed of three parts of acid, five of paraffin, and ten of vaseline, makes a good ointment for eczema and burns.

Boracic acid in solution or mixed with honey or glycerine (1 in 4 or 5) is useful in simple and ulcerative stomatitis and in thrush.

Boro-glyceride, discovered by Barff, is powerfully antiseptic, and is recommended to preserve meat and vegetables. Barff shows that it will preserve meat for months without impairing its quality. It is useful as an injection in ozœna, vaginitis, and urethritis, in the strength of one part in twenty of water.

It is difficult to over-estimate the value of boric acid in its many forms of application.

It is used extensively, both in general and special surgery. Eye surgeons make use of it with the best results in varying strengths up to ten grains to the ounce of water, or even stronger.

Dressings of all kinds, lint, cotton-wool, gauze, are impregnated with it.

It makes an excellent admixture to powders: thus in varying proportions with starch it makes a good dusting powder for infants. A good formula for external use is that of Guy's Hospital, viz.: boric acid one part, oxide of zinc three parts, starch six parts. Such a powder will be found very useful to dust over the skin to keep the parts sweet under a Martin's rubber bandage.

Boric acid is also used internally for its influence upon the urine, as an anti-fermentative. A dose of ten grains every 6 or 4 hours gives very good results in ammoniacal urine and in cystitis—this is a valuable treatment.

Group embracing CAUSTIC POTASH, SOLUTION OF POTASH, CARBONATE AND BICARBONATE OF POTASH, ACETATE OF POTASH, CITRATE OF POTASH, and the corresponding preparations of SODA, also POTASH SOAP, SODA SOAP, BORAX, and some others

THE members of this group are all endowed with a very high diffusion-power, the potash in greater degree than the soda-salts. All are very freely soluble in water. With the exception of the acetates and citrates of potash or soda, they have an alkaline reaction, weak in some, such as the biborate of soda and the bicarbonates, but very marked in others, such as caustic potash or soda.

They dissolve the nitrogenous constituents of the animal textures; and their solvent power is in proportion to, yet distinct from, their affinity for water.

Owing to their affinity for water, and their solvent action upon the nitrogenous tissues, several of these substances, by abstracting the constituent water, will destroy the skin or other structures to a considerable depth. The caustic alkalies possess a greater affinity for water, and therefore a more solvent and destructive action on the tissues, than the remaining members of this group. The solutions of the caustic alkalies and of the carbonates come next; while the bicarbonates, acetates, and the rest of this group, are comparatively feeble agents topically.

The caustic alkalies, undiluted, or mixed with caustic lime to lessen their activity, are occasionally employed to destroy warty growths or the hard edges of some unhealing sores, such as chancres, also to open abscesses, and to make issues.

It must be borne in mind that the caustic alkalies, possessing in common with the rest of this group a high diffusion-power, will penetrate the tissues and destroy them widely and deeply, and, unless great care is taken, the undue diffusion of the alkali will destroy a far larger amount of structure than is intended, producing a large slough, and leaving, of course, a correspondingly large sore. To avoid this, the action of the alkali should always be checked before it has taken full effect, since the corroding will continue for some hours; further, it is essential that other precautions should be observed, lest the caustic alkali dissolved in the fluids of the tissues run over a large surface, and thus extend its destructive action too widely as well as too deeply. In making an issue, therefore, pieces of plaster, with a hole in them of the required size, should be placed one over the other, and the caustic then applied to the skin exposed through the hole; in this way the neighbouring parts are effectually protected. As soon as the application has lasted long enough, it is desirable to wash the surface with vinegar and water to neutralize any remaining alkali. As to the mode of application, the caustic, very slightly moistened, is to be rubbed on the surface till the skin assumes a dull bluish look, and the softened cuticle rubs off easily; the application of a poultice will now help the separation of the dead parts, and ease the pain.

Sodium bicarbonate, ten or fifteen grains to the ounce of water, readily dissolves the false membrane of diphtheria, and this solution is at present used largely as a local application to the throat in this disease, and also to the trachea and larynx, through the wound after tracheotomy.

The carbonates of the alkalies are employed in the treatment of itch, either in the form of soap, or of ointment, to remove the superficial and dead cuticle, and so break up the burrows of the itch insect.

By virtue of the alkali which it contains, soap softens and thus facilitates the removal of the scales of psoriasis.

The solution of a member of this group sponged over the peccant part will often allay the troublesome itching which accompanies many skin diseases. Weak solutions of the caustic salts, or of their carbonates, are the most effective. Thus a solution of carbonate of potash or soda, containing a drachm of the salt to a pint of water, applied with a small piece of sponge, is often of extreme comfort in urticaria or lichen urticatus.[1] A solution of the same strength, of cyanide of potassium, which has also a strong alkaline reaction, is, perhaps, a still more effective application. Here we have a specific action due to the acid radicle in addition to mere alkalinity. (*See* Hydrocyanic acid.)

The itching of many other eruptions, as of scabies, eczema, pruritus ani, and pruritus vulvæ, and the prurigo caused by lice, yield more readily to other applications, which are indicated elsewhere.

In the treatment of eczema a weak solution of carbonate of potash or of soda finds much favour. I have no doubt of its usefulness in the early and middle stages of the disease, when the red and raw surface weeps copiously; but when the weeping has ceased, and especially when mere desquamation remains, the alkali fails to be of use, and other applications are preferable. Dr. Hughes Bennett recommends a solution containing half a drachm of carbonate of soda to a pint of water, the affected surface to be kept constantly moist by a thin piece of lint, soaked in the solution and covered either with oilskin, or with a piece of lint spread with simple ointment; a weaker solution acts sometimes still better. Like the oilskin, the lint spread with ointment prevents evaporation, and being less "heating," is more comfortable to the patient. This treatment is an instance of the general proposition (*vide* section on the topical action of alkalies and acids on the secretions) that alkalies as local applications check alkaline secretions, for the fluid which oozes so abundantly from eczematous surfaces is itself strongly alkaline, and by this alkaline application it is very speedily checked.

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[1] Lichen urticatus is now regarded as a variety of urticaria, and the lichens generally, of the older nomenclature, are distributed under various headings.

It must be admitted, however, in some instances, that an alkali appears to irritate the skin, a result often due to an over-strong solution. During this treatment attention must be paid to the state of the digestive organs, and any irritation produced by teething, worms, or otherwise, should be attended to.

In eczema it is sometimes useful to wash the moist and weeping surface, night and morning, with soap and water; this in many cases checks the secretion, and allays the heat and irritation. If a strong soap is too irritating, a milder one must be used. In chronic forms of eczema, Hebra recommends the application of liquor potassæ, or of a stronger solution of caustic potash. He advises that the liquor potassæ should be brushed over the surface once a day, and, if it produce much smarting, the residue washed off with cold water. When the skin is only slightly infiltrated and thickened, he employs a solution composed of two grains of caustic potash to an ounce of water, but when the infiltration is more pronounced he uses a solution containing from five to thirty grains or more to the ounce.[1] These stronger applications must be employed once a day only, and must be quickly washed off with cold water. This treatment speedily allays itching, but it is liable to make the skin brittle, and to obviate this condition, Dr. McCall Anderson applies every night either cod-liver oil or glycerine. Dr. Anderson frequently employs alkalies in conjunction with tar or oil of cade. He recommends the following prescription:—"Equal parts of soft soap, rectified spirit, and oil of cade. A little of this to be firmly rubbed over the eruption night and morning, and washed off before each re-application." Mr. Startin condemned the use of soap in eczema, or in any skin disease, recommending instead a wash consisting either of yolk of egg and water, or of milk and water.

Sponging the head several times a day with a saturated solution of borax and water is an effectual application in pityriasis of the scalp; it at once eases the itching, loosens the scales, and cleans the head. Pityriasis often gives way in a short time to this treatment, although, unfortunately, the affection is liable to return after a variable period; this, however, happens also when the disease is removed by other treatment. Should the pityriasis prove rebellious, glycerine of borax often shows itself more useful, inasmuch as it keeps the scalp continually moist with the weak alkaline preparation. This plan is useful, also, in eczema of the ears and scald-head.

Acne punctata generally yields to the use of hot water and plenty of soap several times a day, a treatment which keeps open the orifices of the sebaceous follicles and prevents the accumulation of the abundant secretion. If this treatment roughens, reddens, and irritates the skin, it should be well lubricated with glycerine of starch after each washing.

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[1] The official liquor potassæ contains twenty-seven grains in the fluid ounce.

Free ablution with soap and water is very effective in decomposing and removing the acid irritating secretions which keep up the intertrigo so often infesting the buttocks of children, or that seen in the folds of the skin of stout children or underneath the breasts of fat women. After carefully drying the parts, they should be smeared over with some greasy application, this being generally preferable to dusting powders, such as starch powder, oxide of zinc, or boracic acid. Caustic potash or soda has been sometimes used to open abscesses with the intention of preventing scarring, but modern surgery will hardly accept such methods.

A tablespoonful of common washing soda, added to half a gallon of warm water, is useful in the treatment of tenderness of the soles. The feet should be immersed for half an hour twice a week or oftener.

Alkaline fomentations and hot alkaline baths are used in chronic rheumatic affections, also in skin diseases, but their action upon the skin and its secretion is not yet satisfactorily determined; like acid or simple baths they lessen the acidity of the urine. Liveing speaks of them as very beneficial in gouty people with dry chronic eczema resembling psoriasis; in such cases he recommends a course of mild alkaline baths, but adds that great discrimination is to be observed in their choice. (*Quain's Dictionary.*)

Soap with excess of alkali will induce pityriasis of the face, which will often disappear at once on substituting oatmeal or a milder soap, such as "compressed glycerine soap," or "solidified glycerine," or one of the so-called "superfatted" soaps of recent introduction.[1]

Mr. Peppercorne recommends a saturated solution of carbonate of soda as a local application to burns and scalds. Cloths dipped in the solution are applied and covered with oil-silk. If instantly applied, "no vesication or destruction of cuticle occurs and pain is almost instantly relieved. . . . the quickest way" (of applying) "is to use the dry salt made into a paste with a little water and gently rub it over the smarting spot for a few minutes, adding a few drops of water from time to time." (Whitla.)

A weak solution of bicarbonate of potash or soda, a drachm of the salt to a pint of water, is a useful injection to check leucorrhœa, when this discharge depends on an increased secretion of the glands of the os uteri. This secretion is strongly alkaline, and when unduly abundant, the efficacy of the alkaline injection, in such cases, is other proof of the general proposition that alkalies check alkaline cretions.

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[1] Soaps of the superfatted class are variously medicated, *e.g.* Unna's soaps (*Extra Pharmacopœia*), and, thus treated, are extensively used in skin affections.

A solution of borax is very useful in leucorrhœa. It will act partly virtue of its alkalinity, partly as an antiseptic.

When the leucorrhœal discharge is clear, like white of egg, or when t is lumpy, but not yellow, three or four injections will generally heck it. On the other hand, when the discharge is yellow and puriform, the injection may fail; yet even here, in many cases, the yellow discharge being due to mere abrasion of the os uteri, the injection, continued for one or two weeks, will change the yellow to a white discharge, and sometimes cause this also to disappear. If the leucorrhœa is produced by displacement of the uterus, or ulceration of its neck, this injection, like many others, though temporarily checking the discharge, will not prevent it from soon returning; in such cases the leucorrhœa will not be cured till the causal conditions are removed.

The success of an injection depends obviously on its reaching, and coming well in contact with, the os uteri, the offending part; hence it is necessary to give full and careful directions as to its use. The patient should be directed to lie on the back, to raise the buttocks by placing a pillow under them, and then to introduce the vaginal tube of the syringe as far as she can, without using force, and to leave the injection in the vagina about five minutes. The injection should be used tepid or cold, when it can be borne, twice or three times in the day. A Higginson's syringe is well adapted for the purpose, or a syphon apparatus or a Kennedy's syringe, by means of which any quantity of lotion may be forcibly injected, and which, by washing away the discharges and douching the part with a cold or warm medicated application, will be found even more effectual. A great secret in the success of this treatment lies in the use of plenty of the injection. Not less than a quart should be used each time. (Whitla.)

Mr. Norton, of St. Mary's Hospital, ingeniously employs a solution of liquor potassæ (two drachms to the ounce of water) in the treatment of ingrowing toe-tail. "A piece of cotton-wool is saturated with the solution, and pressed gently down between the upper surface of the nail and the soft tissues. The solution permeates the substance of the nail, and softens and pulpetizes the superficial cells. The wool is kept constantly moist with the lotion, and the softened tissues are wiped away each morning. The nail in a few days becomes thin and flexible, and, if desired, it can be pared away without pain. The lotion should be continued until all ulceration has disappeared."

Borax is antiseptic, and prevents fermentation and putrefaction. It coagulates yeast, and destroys its power to decompose sugar into alcohol. It destroys the action of diastase and of emulsin, and so prevents the conversion of starch *into* glucose, and the formation of essence of bitter almonds and prussic acid from amygdalin. It also destroys the action of myrosin, preventing the formation of the pungent essence of mustard from the mustard flour. In these anti-fermentative powers of borax we see again the action of boric acid, to which acid, indeed, the borax owes these special powers. Borax, however, is a weaker antiseptic than boric acid.

Borax and honey, or the glycerine of borax, is often used for aphthæ. In aphthæ the mucous membrane usually presents small, round, sharply-cut superficial ulcers, covered with a pultaceous exudation. Aphthæ, naturally, run a short course, and when left untreated get well, in most cases in a week or ten days, but the cure is hastened by borax. The same preparations of borax are useful in removing the curdy exudation of thrush. In other morbid conditions of the mouth borax is useful.

Dr. Corson finds that a piece of borax the size of a pea, dissolved in the mouth, acts magically in restoring the voice, in cases of sudden hoarseness brought on by a cold; frequently, for an hour or so, the voice is rendered "silvery and clear."

Borax is useful in the hoarseness, common among clergymen and singers, from voice strain.

Sir J. Simpson recommended borax in "the pruriginous eruption which appears on the mucous membrane of the vulva, and extends up along the vagina as far as the cervix uteri. This eruption may also extend to, sometimes, indeed, is originally situated upon, the cutaneous border of the vulva, and thence over the outer cutaneous surface of the labium, spreading backwards along the perinæum to the circle of the anus. It is a flitting and transient affliction, recurring with menstruation, pregnancy, or delivery. At times it is more fixed, and may last weeks, or months, or years, producing constant irritation and distress, frequently interfering with rest and sleep, and rendering the victims miserable and almost beside themselves and often quite unable to resist the attempt to alleviate the itching by constant and sometimes rough friction. The mucous membrane in such cases becomes at the most irritable parts white, and thickened with red fissures." This distressing complaint, says Sir J. Simpson, "may be generally cured by the assiduous and persevering application of a solution of biborate of soda (five or ten grains to the ounce of water)." A hot solution enhances much the efficacy of the borax. Water alone, as hot as can be fairly borne, will often allay this itching, but hot water with borax is far more efficacious. If this treatment fail, an infusion of tobacco may be tried; or an ointment of iodide of lead (ʒj. to ℥j.), or one of bismuth and morphia. Chloroform vapour, liniment, or ointment, is often found useful; a drachm of chloroform may be incorporated in an ounce of some sedative liniment or ointment. A strong lead lotion or a solution of nitrate of silver often does good. Dr. Simpson says: "There is a great advantage in alternating these local applications, for most of them begin to lose their effects when persevered in above a few days. In the most obstinate and severe cases strong astringents are sometimes of the greatest use, such as a strong solution of alum or tannin." Menthol soap is sometimes very efficacious in pruritus vulvæ, it is at the same time a cleanly application. It may be applied in a thick lather, after first sponging well with hot water. In the severer cases of pruritus the lather may be left to dry on or may be kept moist by means of some impermeable dressing. Such soap is prepared under Dr. Eichhoff's direction. Menthol-eucalyptol, also thymol soaps are used for the same purpose.[1]

Borax is administered internally in the treatment of epilepsy. It does not take a very high place on the list of drugs recommended for this disease, but according to Gowers it is useful in some inveterate cases which resist bromides. Fifteen to thirty grains may be given after food, three times a day. The drug occasions gastric irritation in not a few cases, and this may necessitate its discontinuance. We shall keep borax in reserve, at any rate, till the bromides have had a full trial.

Garrod employs strong solutions of lithia salts to remove gouty enlargements. Gout-stones are composed of urates; urate of lithia is among the most soluble of uric acid salts, and accordingly a strong solution of a lithia salt is applied with the intention of converting the urates deposited in the tissues into urate of lithia, and so soaking the urates out through the skin. The swelling must be kept constantly enveloped in lint or rag moistened with the lithia solution. In Garrod's practice this treatment has proved very successful. He thinks that the lithia salt formed thus with the uric acid passes into the blood, and that in this way gout-stones are reduced. He employs carbonate of lithia, five grains to the ounce, and with this claims to have removed considerable enlargements and to have restored suppleness and even free movement to stiff and useless joints. I also have employed this treatment with considerable success. It is especially useful when the skin is broken over the gouty enlargement. It is well known that a sore of this kind is extremely difficult to heal, but by this treatment the urates imbedded in the connective tissues are dissolved and washed away by the lithia solution through the broken surface, and thus the sore is enabled to heal: the citrate of lithia is the salt to be preferred. A strong solution of citrate of potash is, however, nearly, if not quite, as useful. This latter probably converts the biurates into neutral urates, and in this more soluble form the uric acid is carried off through the skin: equal parts of citrate of potash and water may be used. Neither the solution of citrate of lithia, nor that of citrate of potash, irritates the skin. As might be expected, this treatment takes many weeks, or even months, to effect much reduction of large deposits.

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[1] These and other medicated soaps are prepared in Germany, under the control of Dr. Eichhoff; in this country they are manufactured by Midgley, of Manchester.

Kappesser has drawn attention to the value of soft-soap as an application to scrofulous enlargements generally, including glandular, bony and periosteal inflammations, also in non-scrofulous lymphadenitis, and in acute and chronic inflammations; Beetz and Senator confirm and supplement his recommendations. Soft-soap is applied each night and rubbed off next morning, or linen rags soaked in a solution of soft-soap ℥ij., alcohol or eau de Cologne ℥j., are applied. Soft-soap has been used successfully in scrofulous mesenteric disease. In caries and periostitis about fifteen grammes of green soap are rubbed over the part, and in half an hour washed off. Senator finds soft-soap inunctions useful in syphilitic glandular swellings, and in serous exudations, including exudations into synovial cavities.

The official soap liniment made from hard soap finds a somewhat similar application in chronic inflammatory troubles; it is, however, a much weaker preparation so far as the soap is concerned.

The action of the members of this group on the stomach was somewhat anticipated when it was shown that alkalies increase the secretion of the gastric juice, and may thus prove useful to promote digestion. It is obvious, however, that method must be observed, or an effect contrary to that intended will ensue; for, if given soon after a meal, the alkalies will neutralize the acid of the gastric juice, and effectually retard and impede digestion. Alkalies intended to increase the quantity of gastric juice, and to promote digestion, must be taken a short time before a meal. The alkaline saliva swallowed at the beginning of a meal is highly useful in this way, although, inasmuch as it must speedily become neutralized by the acids of the stomach, its action will be but temporary. Alkalies may be usefully administered in many forms of atonic dyspepsia, and in other forms associated with deficient secretion of the gastric juice. The bicarbonate of soda is the salt generally employed.

When, on the other hand, a patient complains of heartburn and acid eructations, these disagreeable symptoms may at once be removed by the exhibition of an alkali, such as the bicarbonate, which neutralizes the excess of acid in the stomach; it must always be remembered, however, that this treatment is merely palliative. No doubt administered thus a course of alkaline treatment appears sometimes to remove acidity, but the good attributed to the alkalies may, with great probability, be ascribed to the tonic with which in these cases they are generally combined. The bicarbonates are preferred to the more caustic salts on account of their milder action. The acetates and citrates being neutral, and becoming alkaline only by decomposition in the intestines or blood, are not adapted for this alkaline gastric treatment. The bicarbonates can be continued longer than the more caustic preparations because of their milder topical action, but they ve the disadvantage of giving off much carbonic acid gas, which y cause trouble from distension of the stomach. To prevent this, gnesia (the oxide), which is an alkali, and acts like the members of is group, may be substituted if the bowels are confined, or limeater if they are relaxed.

Alkalies are apparently sedative to the stomach, at least they often elieve the pain of this organ. Liquor potassæ is generally employed n such cases.

In cases of poisoning by any of the acids, those alkalies which are the least irritating to the stomach are employed to neutralize and to prevent the further action of the acid on the tissues. The oxide of magnesium, heavy or light, is the alkali, *par excellence*, in such cases. All carbonates are to be avoided, since the free liberation of carbonic acid in an organ already damaged by corrosion might be very dangerous.

In poisoning by metallic salts and alkaloids, the bicarbonates of the alkalies may be used to precipitate the insoluble oxides or oxycarbonates of the metals or the alkaloids themselves. Magnesia, acting as a slight purgative, and so helping to expel the poison from the intestinal canal, is generally preferred.

By virtue of their diffusion-power, the substances contained in this group pass so readily into the blood, that but a small proportion of them reaches far into the small intestines. Little is known of their action on the small intestines, and on the organs which pour their secretion into them, yet it seems probable that those secretions having an alkaline reaction may be affected in a double and opposite way, according to the period of administration of these drugs. The secretion rom the intestinal glands is alkaline, and hence, if the general proposiion elsewhere formulated be valid, acids applied to the orifices of their lucts should augment their secretion, while alkalies should have the ontrary effect. But we have seen that alkalies, given before meals, ncrease the secretion of the acid gastric juice, and thus augment the cidity of the whole intestinal canal: they should therefore increase he secretion of the intestinal glands and likewise the biliary and panreatic secretions. On the other hand, if given after a meal, alkalies, y neutralizing the acid in the stomach, should lessen the secretion rom the liver and pancreas, and the intestinal glands. On these oints, however, nothing is known with certainty, the foregoing stateents being conjectural merely.

Rutherford concludes from his experiments that bicarbonate of soda jected into the duodenum of fasting dogs "has scarcely any effect n the secretion of bile."

The milder alkalies, such as the bicarbonates of potash, soda, or agnesia, may be used with great benefit in diarrhœa, caused by an xcess of acid in the intestines; by neutralizing the excess of acid, hese substances will arrest the diarrhœa.

Soap is often added to rectal injections, to suspend castor-oil or turpentine; it here serves physical or physico-chemical purposes. But soap itself is used for its influence upon the lower bowel, viz., as a mild and safe purgative. A piece the size of the thumb, covered with castor-oil or merely wetted with water, and thrust up the rectum as high as the finger will carry it, will in a short time produce an easy, copious, and natural evacuation. This plan is especially available for infants and children, the size of the soap plug being somewhat smaller.

On entering the blood, alkalies undergo various changes, according to their composition. The acetate or citrate, which has not already undergone a like change in the intestines, becomes converted into the carbonate, the form which is, probably, assumed ultimately by the oxides of the alkalies. This conversion is the result of an oxidation of the organic salt.

The alkalinity of the blood must therefore be increased by these alkalies, not, probably, to any great extent, as, from their high diffusion-power, they will be rapidly eliminated by the kidneys, and therefore the alkali will not be able to accumulate. There has been much speculation concerning the effect of this increase in the alkalinity of the blood. The alkalies are known to promote oxidation, and hence it has been conjectured that oxidation in the blood, and in the tissues, may be increased as a result. It has been suggested therefore that alkalies might be profitably employed in diabetes to promote the oxidation of the sugar. Alkalies have also been advocated in cases of excess of uric acid in the urine, in the expectation of oxidizing this product of nitrogenous waste, and so of converting it into urea or some other product of a more complete combustion. Alkalies are sometimes given to fat people to increase oxidation, and consume the superfluous fat, and so to control unseemly obesity. The solutions of the bicarbonates, and especially of the oxides, are occasionally used for this purpose, but the evidence in favour of this treatment is not clear.

As to the power of alkalies to increase the oxidation of fats, it is certain that the long-continued administration of the more alkaline preparations will induce much wasting of the body: this admits of no doubt, but it would appear that it is effected by a disordering action on the mucous membrane of the stomach, whereby a mal-assimilation is caused, and not by a more energetic metabolism.

To diminish fatness in a way so likely to damage health, and even to endanger life, is surely a mistake. Some writers of authority insist, it is true, that obesity may be thus reduced without any ill effects on the mucous coat of the stomach; thus Dr. Neligan states that he has often removed an uncomfortable excess of fat by the use of liquor potassæ, without in any way injuring the patient's general health. However, though occasionally successful, this treatment, as a rule, fails signally.

The action of alkalies in diabetes appears to be valueless, for hey in no degree lessen the amount of sugar separated by the idneys.

Nor does it appear to be established that alkalies can oxidize uric cid in the blood; at least there are no experiments in proof of this. It is, however, very useful to give alkalies in the uric acid diathesis, in order to render the urine weakly acid, or even alkaline, and thus convert the excessive quantity of uric acid into a more soluble urate. This treatment will prevent the growth of uric acid calculi, and even reduce them by a slow solvent action.

In gouty conditions the view is generally held that the *potash* salts, especially those which are alkaline or which become alkaline in the system, do affect the chemistry of the tissues, causing an increased oxidation and therefore preventing to some extent the formation of uric acid. In favour of this view there is certainly some clinical evidence, but the action is to be regarded as a potash rather than as an alkaline effect.

Micturition in young male children causes not unfrequently severe pain; this has been traced to the existence of uric acid or of the biurates, in the form of spicular crystals, which in their passage irritate the urethra. By alkalinizing the urine, these crystals are dissolved and rendered innocuous. The citrates having very little action on the mucous membrane of the stomach are the salts best adapted to neutralize the acidity of the urine.

After the passage of alkalies into the blood, and their conversion into carbonates, the action of these substances is at present but little known. The integrity of the blood, as of the tissues, is doubtless intimately concerned with the nature and proportion of the salts in the circulating fluid, but little real insight into this domain of chemical physiology and pathology has been gained as yet. Garrod is of opinion that scurvy is due to deficiency of potash salts in the food, a surmise supported by many facts, but not yet confirmed by exact observation.

Rossbach, in his experiments on animals, finds that alkalies acting through the blood dry up the normal secretion of the bronchial mucous membrane. The reverse of this is supposed to happen, therapeutically, for alkalies are given in chronic bronchitis with viscid, scanty expectoration, to increase the secretion and lessen its viscidity. Rossbach in his experiments used very large quantities of alkalies, and this excess may explain his results. Recently, Dr. James Calvert, repeating Rossbach's experiments, finds that alkalies promote rather than check the secretion of the bronchial tubes. Dr. Calvert used the same quantities of sodium carbonate as Rossbach, but his experiments are not very numerous on this point.

Carbonate of potash, in one or two grain doses, given three or four times daily, with a little syrup to cover the taste, has been much used in Philadelphia for whooping-cough.

Dr. Walshe recommends the liquor potassæ in plastic bronchitis.

The bicarbonate or citrate of potash is often employed in rheumatism. This disease is supposed, according to one view, to be caused by an excessive formation of lactic acid, which, having an affinity for certain tissues of the body, excites in them the rheumatic inflammation. Alkalies are given to neutralize this acid, and to protect the tissues from its action. But so little is known about the nature of rheumatism, that it is impossible to approach the question of its treatment from the theoretical side, and since careful and exact observations on this treatment do not exist we really possess little more than individual impressions. This much, however, must be conceded, that in many cases rheumatic pain is much relieved as soon as the patient is well under the action of an alkali and the urine has ceased to be acid.

Many eminent authorities are firmly convinced that the alkaline treatment renders rheumatic fever both milder and shorter, and diminishes the danger of heart complications; but having made many careful observations on this point, I am led to believe that, due attention being paid to the age of the patient, and to the character of the attack, it will be found that these salts are unavailing either to lessen the intensity or the duration of the fever.

In the fifty-second volume of the *Medico-Chirurgical Transactions*, Drs. Gull and Sutton published a paper on the value of remedies in rheumatic fever. The cases quoted, although not numerous enough to settle this much-vexed question, led them to the conclusion that alkalies, lemon-juice, blistering, did not shorten the course of rheumatic fever, though it was not denied that these remedies might allay the pain. They further concluded that neither alkalies, lemon-juice, nitrate of potash, nor blisters, prevented the occurrence of heart disease in rheumatic fever. In dealing with statistics relating to the treatment of rheumatism it is necessary to be specially cautious, for the present tendency, warranted by observation, is to consider that hereafter rheumatism may have to be differentiated into many varieties. Already we have distinctive rheumatic fevers, due, *e.g.*, to weather influence, syphilis, lead, etc., and furthermore we may often find it very difficult, or at first even impossible, to distinguish gonorrhœal rheumatism and acute febrile rheumatoid arthritis from rheumatic fever. In rheumatism there is a large unworked field of inquiry.

The influence of age, as modifying the type of the disease, in acute rheumatism is very important, and must therefore be taken into account. Thus in children the attack is wont to be sharp and short, declining even when untreated in from five to ten days, and, further, whilst the danger to the heart is much greater than in the case of adults, the joint affection is often so slight that during an acute attack, with a temperature varying between 103° and 104°, the child may

mon cause of death in acute rheumatism, rarely occurs in
r in middle-aged people. Children rarely die of acute rheu-
indeed, I have never seen a child die of this disease. The
observations make it obvious that, in testing the efficacy of
we must take care not only to discriminate one kind of
m from another, but to compare together those cases which
ersons of about the same age.

quency of relapse in acute rheumatism is well recognised. I
is relapse is in many cases explicable and avoidable. Thus
nd that when the temperature has become nearly normal,
y to 99·5°, 100°, or a little over, there may be no pain;
is this so in the case of a child, and the patient may feel so
permission may be given to get up and walk about, to the
of a return of the fever and joint-pain. In the ward I have
verified the fact that relapses are often brought about in
and I am sure it is much safer to take care that the tem-
hould become normal, and remain so for several days, before
it is allowed to get up. These cases illustrate well the
e of the thermometer, since so slight a degree of fever as
mentioned is quite undetectable by the hand. To utilize to its
s instrument the temperature must be taken several times a
e preternatural rise may last only a few hours, daily. Move-
e joints in rheumatic fever inflames them and heightens the
a joint, free from inflammation and pain, is worked by the
a short time, it often becomes, within a few hours, acutely
id red. Again, it is well known that the journey to the
ften excites inflammation in patients' joints and heightens
and that simple rest during the few first days in the ward

indefinite time without deranging the general health, yet this drug increases the alkalinity of the blood, though, owing to its neutral reaction, it is harmless to the stomach.

The liquor potassæ bears the reputation of promoting the absorption of inflammatory formations, and, with this object, it is occasionally employed in pleurisy, but its good effects are not evident, and the disorder it produces in the stomach renders its use inadvisable for any length of time.

Drs. Wood and Reichert find that potash salts increase about equally both heat formation and heat dissipation through the skin. Large doses of potash salts depress the temperature considerably. Experiments by Feltz and Ritter and Astaschewsky support the idea that uræmia is due to the retention in the blood of potash salts. They tied the renal arteries of animals, and injected various substances into the blood, amongst others potash salts, and produced uræmic symptoms.

What influence have the alkalies on tissue change? Dr. Parkes has investigated the action of the liquor potassæ, and he thinks that it probably increases the disintegration of the nitrogenous components of the body. He believes that his experiments justify him in concluding that it disintegrates also the sulphur-holding tissues, for liquor potassæ increases both the urea and the sulphuric acid of the urine. The strong alkaline reaction of liquor potassæ unfits it to be given in doses sufficiently large to affect in any great degree the reaction of the urine, so that when it is desired to alkalinize this fluid the bicarbonate or citrate must be employed.

What further action have alkalies on the urine? They are all reputed to be diuretic, but, as no exact observations have been made with these salts, this statement must be regarded as a probable assumption only.

Before referring to the presumed diuretic properties of these substances, it will be well to digress for a short space to speak in general terms of diuretics.

By diuretics, we understand medicines which act as promoters of the flow of urine; and we must distinguish diuretics from those medicines which, by promoting tissue changes, cause an increase in any one or more of the constituents of the urine. Diuretics merely separate from the system already-existing products.

As the urine is a complex fluid containing, besides water, many salts and other ingredients, we may have medicines which will eliminate one or more of these substances, but leave the rest unaffected. We may therefore have diuretics in respect of the water, the urea, or the uric acid, etc. The retention in the blood of materials which should be eliminated by the kidneys may be due to a variety of conditions. The physical state of the kidneys may be altered, and these organs thereby disabled as a result of disease of distant organs, as of the heart; or, the retention of the urinary ingredients in the blood may be dependent on organic disease of the kidneys themselves; or, again, owing to insufficient oxidation and combustion of the effete products of disintegration, the refuse materials of the blood may remain in a form difficult of excretion by the kidneys.

Thus, in one instance, a medicine acting on some organ at a distance from the kidneys, as upon the heart or lungs, will act as a diuretic; while in another case, diuretics may act immediately on the kidneys and remove or alter those physical conditions which hinder the action of the organs; lastly, diuretic action may be induced by such means as will promote oxidation in the blood.

How far do the members of this group act as diuretics? and in which of the foregoing ways? We cannot give very satisfactory answers to these questions.

First, as to the fact of their diuretic action.

It is generally held that all these substances are diuretic, and, under certain circumstances, they may possibly become so. Acetate of potash and acetate of soda enjoy the highest repute in this respect, though some careful observations which have been made with these substances on persons in health have led to unexpected results. Thus it was found by Böcker (quoted by Parkes), "that so far from acting as a diuretic in health, the acetate of potash diminished the water, the urea, the extractives, and, in a remarkable manner, the earthy salts." Some valuable observations concerning the action of citrate of potash and acetate of potash, as diuretics in health, have been made by Dr. Nunneley on himself. He took daily, for twelve days, three to five drachms of citrate of potash. On an average, the daily excretion of water was increased by two ounces and a half, but the urea was lessened by eighty-four grains, and the solids by sixty grains. The acetate of potash, in daily doses of from two and a half to three and a half drachms, exerted a similar influence in a somewhat less degree.

But should we expect medicines to act as diuretics or eliminators in healthy persons? In such, the excretory organs being active and adequate to remove from the blood the products of disintegration, there should be but little urea or uric acid or other ingredients to be eliminated, and we must therefore be careful in how far we allow physiological experiments on healthy subjects to guide us as to the action of diuretics in disease. That such caution is the more needful is shown by the positive experiments of Ranke, who, after giving acetate of potash, noticed a very considerable increase in the quantity of urine voided soon after, showing that this salt will at times act as an eliminator of water.

Accepting the diuretic action on the basis of clinical rather than of experimental evidence, *i.e.* on pathological not on physiological grounds, we will endeavour now to answer the second part of the foregoing question—In what way do they act as diuretics?

It is not supposed that any members of this group act upon organs remote from the kidneys, such as the heart; they may however possibly promote oxidation in the blood, and so favour the transformation of effete nitrogenized products into urea, in which form they will then be separated by the kidneys. It has already been mentioned that the members of this group render the urine less acid, or even alkaline; the amount of acid, however, which is excreted in the urine is actually increased, but being neutralized by the alkalies, it gives no acid reaction. This increased output of acid points to an increased metabolism unless the tissues are deprived of acid and become themselves more and more alkaline. Another way in which these salts may act in respect of the elimination of water is by their diffusion-power, by an action therefore allied to osmosis.

Again, some of the alkalies are considered to be febrifuge, *e.g.* the citrates and acetates. If so, they might act indirectly as eliminators of water, by promoting the decline of fever, for, as is well known, upon this decline an increased elimination by the kidneys takes place of that water, which was previously held back in the system; often this is accompanied by a simultaneous increase in the solids of the urine. If, therefore, the alkalies will check fever, the increase of water and of solids must, indirectly, be due to their action.

These alkalies are generally reputed to act also as diuretics when the kidneys are diseased, the citrates and acetates being given in acute and chronic Bright's disease. Some explain this as the result of the making of the urine alkaline, it being thus enabled, so they say, to dissolve the organic but diseased matters, which block up the uriniferous tubes in Bright's disease, and hinder the secretion of the kidneys.

The citrates and bicarbonates are constantly employed to render the urine alkaline, when the urinary organs are irritated or inflamed, as in cystitis and gonorrhœa; but if in cystitis, the urine, before it is passed, is already alkaline from decomposition of the urea, alkalies must not be administered, for by increasing the alkalinity of the urine, they will still further promote the decomposition of urea, and the formation of carbonate of ammonia.

When excess of uric acid occurs in the urine, it should be kept for a time alkaline. By many careful and ingenious experiments, Sir W. Roberts has shown that uric acid calculi may probably be dissolved in the bladder if the urine is maintained alkaline for some weeks. This treatment is likely to be useful also in renal calculus, which is generally composed of uric acid only. In such case it is not unreasonable to expect that the alkaline urine may in time reduce the calculus sufficiently to pass down the ureter. We certainly meet with patients complaining of much pain in the back, passing bloody urine, containing a large quantity of uric acid crystals, and a little pus, who are cured by large doses of citrate of potash.

Potash salts exist abundantly in the milk, whence it has been suggested that the administration of these salts may promote this secretion. The administration would, of course, have to be kept well within limits and short of disturbing digestion.

In conclusion, I may here introduce a summary of some interesting experiments made by Dr. Paul Guttmann, and some by myself, which confirm many of the conclusions of Claude Bernard and others, on the action of potash and soda salts. The results are singular, and scarcely in accordance with medical experience of the action of these substances on the human body. (See also the chapter on the relative effects of potassium and sodium salts.)

POTASH SALTS are all far more poisonous than soda salts.

Potash salts are all equally poisonous and equally fatal in the same space of time, if administered in the same way.

Chloride of potassium, carbonate of potash, and nitrate of potash, in identical doses, are equally powerful to destroy life, and in the same period of time, even when either salt, previous to injection, is mixed with a solution of albumen.

The acid of the salt plays no part in the fatal result.

In poisonous doses, great muscular weakness sets in, first appearing in the hinder extremities : in warm-blooded animals, dyspnœa and convulsions take place. Large doses lessen the frequency and force of the heart's beats, and sometimes make them irregular. This holds good for all potash salts. Large doses at once arrest the action of the heart, which always ceases to act in diastole.

Traube asserts that the action on the heart is affected through the vagi nerves. Guttmann considers this view erroneous, since, after the vagi were both divided, and the medulla removed, the potash salts still affected the heart as before, and even when the vagi were paralysed by woorali, the potash salts still acted as usual on this organ. Whether their effect on the heart is owing to an action on the heart's substance, or on its ganglia, Guttmann cannot say. He states that these salts lower the temperature of the body, to a very insignificant extent only.

SODA SALTS, in twice or three times the quantity which proves fatal in the case of the potash salts, produces no effect on the system except a passing weakness.

Even in larger doses, soda salts exert no action on the heart, cause no diminution in the temperature, and produce no apparent effect on the cord, brain, nerves, or muscles.

The heart of a frog suspended in a solution of potash ceases quickly to contract, whilst it takes a much longer time to produce a like effect in a solution of soda of similar strength.

Many soda salts produce an opacity of the lens in frogs ; this does not occur, however, with sulphate of soda. Guttmann shows that the opacity is not due to mere abstraction of water from the lens, although the condition is removed by immersing the opaque lens in water. This opacity does not take place in mammiferous animals.

Some experiments on chloride, bromide, and iodide of potassium which I made, in company with Dr. E. Morshead, led us to conclusions similar to those arrived at by Guttmann. We found that these three salts produced the same symptoms in the same order, and in an intensity proportioned to the amount of potash they contained.

In conjunction with Dr. Murrell, I have made some further investigations concerning the action of chloride of potassium. (*Journal of Physiology*, vol. i., No. 1.)

This salt is, we find, a protoplasmic poison. It poisons all nitrogenous tissues and destroys their functions. A subcutaneous injection speedily affects the brain and cord, causing complete general paralysis, and in a few hours the motor nerves, when directly stimulated by the interrupted current, will be found to conduct impressions no longer. A little later still the muscles will not contract to electric stimulation. Now this paralysis of all the tissues is due to the direct action of the potash, and not to the arrest of the circulation, since the paralysis of the nerves and muscles occurs much earlier after poisoning with chloride of potassium than after mere mechanical arrest of the circulation. We conclude also that the chloride acts by an equal affinity for all protoplasm, and destroys the tissues in the order of their vital endowments.

Potash salts are depressors and paralyzers of the heart. How do they effect this? In the same manner, we conclude, as they paralyze the other structures, viz., by an affinity for all the nitrogenous tissues. The more highly endowed nervous ganglia are the first to suffer, hence small doses will arrest the heart, whilst the muscular tissue is still able to respond to galvanic stimulation, but, if into the jugular vein a large quantity of a potash salt is at once introduced, it will destroy not only the functions of the nervous structures, but also muscular contractility. Thus Guttmann found that the injection of *small* doses into the jugular vein of warm-blooded animals paralyzes the heart through the nervous system; whilst Traube found that the injection of a large dose paralyzes also the muscular tissue of the heart, so that it failed not only to contract spontaneously but also upon the application of galvanism. These experiments support strongly the views we have advanced.

If it seem strange that chloride of potassium should produce such profound effects on the frogs, whilst to man it appears so harmless, we need merely point out that our frogs were given quantities proportionate to from 3 to 9 oz. for a man weighing 150 pounds; a dose of this magnitude thrown at once into the circulation would, doubtless, in man also, affect profoundly the chemical and physical condition of the blood, and the functional activity of the organs. These colossal doses cannot therefore be compared in their effects with the, relatively, minimal therapeutic doses.

As arrest of the circulation is itself a paralyzing influence, we conclude that arrest of the circulation caused by the chloride of potassium must, in some degree, assist in producing the sum total of the effects on the tissues.

In the chapters on bromide of potassium and on the relative effects of potassium and sodium salts, we have shown that this potassium salt produces the same symptoms, in the same order as other potash salts, and that the more or less rapid induction of these symptoms depends on the amount of potash the salt contains. Bromide of potassium, like the chloride, paralyzes not only the central nervous system, but likewise the nerves, muscles, and heart, the central nervous system being affected sooner than the nerves, and the nerves sooner than the muscles, and therefore we conclude that these effects of bromide of potassium, which it possesses in common with all potash salts, are due solely to the potash, the bromide playing no part in the process. Again, these conclusions, though holding for the colossal experimental dose, cannot be made to cover clinical experience.

The action of potash salts differs from soda salts, not merely in degree but in kind also. We find in the vegetable kingdom that soda salts will not replace potash salts. In animals we find potash salts predominating in the formed, soda salts in the unformed, constituents of the body. A potash salt is necessary for the dilatation of the heart after a contraction, and for this purpose soda salts cannot in any degree take the place of potash salts. Potash salts lessen muscular excitability; prolong the period of diminished excitability, and retard reparation following a contraction, in these respects strongly contrasting with soda salts. These physiological differences imply therapeutic differences, and hence one base cannot be given in place of the other.

In respect of this last paragraph, we are certainly justified in drawing this conclusion, though it has been reached from the colossal dose effects, viz., that we should always give the preference to a sodium salt *if it will apparently yield us the same result as a corresponding potassium salt.*

AMMONIA, CARBONATE OF AMMONIA, SPIRITS OF AMMONIA

THESE preparations have many properties in common with the alkaline potash and soda group. They possess a strong alkaline reaction, are freely soluble in water, have a high diffusion-power, and dissolve the animal textures. They differ from the potash and soda preparations in their volatility, in being more powerful local irritants of the living animal tissues, and hence in exciting very active inflammation.

Their action on the skin is, in many respects, similar to that of the alkaline potash and soda preparations. Owing to the water in its composition, liquid ammonia manifests comparatively little attraction for that of the tissues; hence, and for the reason also that its solvent action on the textures is less than that of sodium or potassium hydrates, its destructive powers are much less rapid and extensive. Owing, however, to its high diffusion-power, it readily penetrates the cuticular covering of the body, and excites a degree of active inflammation sufficient to destroy the tissues and so produce, first a slough, then an ulcer. The preparations of the members of this group are never purposely employed to produce formidable and deep destructive changes in the tissues, but they are used, in the form of liniments, as vesicants and rubefacients.

Ammonia solution may be employed to produce very speedy vesication. For this purpose a few pieces of lint should be cut a little larger than the required blister, and on the lint should be poured ten or twenty drops of the strong solution of ammonia; the pledget must be applied at once to the skin, and covered with a good-sized watch-glass. Heat, with some smarting and tingling, is soon felt, and in a short time a rim of redness appears around the glass, denoting that the application has done its work; a poultice then will promote vesication, and ease the burning pain. In this way a blister may be produced, sometimes in ten minutes, though it may take half an hour; the difference in the vesicating action of ammonia is, however, so great, that in some cases a blister does not form at all. Hence, it must be considered as, at best, a very uncertain vesicant.

As a rubefacient, or "counter-irritant," it is more useful; but it is in no respect superior to a mustard poultice, the materials for which are always at hand. The liniment of ammonia, if merely rubbed or dabbed on the skin, acts very imperfectly as a counter-irritant, but if applied on lint, or linen, and kept in contact with the skin, decided rubefaction will take place in a few minutes.

As a counter-irritant, ammonia is used for the same purposes as mustard poultices or blisters.

Ammonia is a useful stimulant to the scalp to promote the growth of hair thinned by illness. Wilson uses half an ounce of the strong liquor ammoniæ to six ounces of honey-water, scented with almond oil and spirit of rosemary.

Dr. Tilt extols Raspail's sedative lotion in the treatment of headaches occurring at the change of life, or produced by defective uterine functions. This lotion, made by adding two ounces of liquor ammoniæ, and of common salt respectively, with three drachms of camphorated spirits of wine, to thirty-two ounces of water, is applied to the painful part with a small sponge, and is renewed as often as may be required. It excites a sensation of burning, and reddens the scalp. If too strong it should be diluted with water. I have often found a similar application very useful in removing the "heat and weight" at the top of the head, so frequently occurring in women at the change of life, or in those who suffer from uterine derangements, or from generally impaired health.

The weaker solutions of ammonia are sometimes applied to the bites or stings of insects, such as wasps, spiders, etc., to neutralize, it is said, the formic acid, the active principle of the poison.

Formic acid is commonly said to be the poisonous principle in insects, whose bites or stings excite pain or inflammation. This, I think, can hardly be correct. The sting or bite of an insect affects some persons much more than others. The bite of a bug or flea will, in one person, cause considerable swelling, whilst in another it will excite neither pain nor swelling. Even in the same person we may find that, perhaps, when young, insect bites or stings scarcely affected the patient, whilst later in life they would cause much swelling and pain, or *vice versâ*. Again, a bug-bite may cause great swelling, whilst in the same individual the bite of a gnat, flea, or midge may cause no inflammation; or the bite of a midge may excite considerable swelling with much itching, lasting eight or ten days, whilst to the same person the bites of other insects are quite innocuous. Now these differences could not be if the active principle were always the same. It is evident, therefore, that there must be some difference in the nature of the poisons secreted by different insects, and that it cannot depend on formic acid alone; if therefore this acid is always present in the poison of insects, it must be mixed with some other virus differing in different animals.

Mr. Philip Miall recommends fomentations, with a solution of twenty grains of carbonate of ammonia in a pint of boiling water, for threatened mammary abscess. When the breast is hot, reddened, throbbing, and painful, the effect is very speedy, the swelling often subsiding within a few hours. The fomentations must be assiduously applied for half an hour at a time, and repeated every two or three hours.

Salts of ammonia, applied to the nose, and breathed into the air-passages, are commonly used in fainting, and in poisoning by narcotics. By stimulating the mucous membrane, the ammonia excites reflexly the circulatory apparatus, and averts syncope. Ammonia salts are also inhaled in the early stages of cold in the head, as derivatives, to remove the pain and inflammation of the nose and frontal bones. Ammonia inhalations have been recommended in chronic bronchitis to ease, and probably to lessen, the over-abundant expectoration by directly stimulating the mucous membrane.

Ammonia in the stomach acts much in the manner as it acts upon the skin. It first neutralizes the acid it encounters, and is therefore an antacid, but at the same time, even if completely neutralized, it acts as an excitant, or irritant of the mucous membrane.

Soon after the administration of ammonia, therefore, a sensation of warmth at the pit of the stomach sets in, which quickly spreads to the rest of the body, and when the functions of the stomach and upper part of the intestines are depressed, it may be thus used as an excitant. It often obviates colic of the intestinal canal, and braces up the relaxed mucous membrane. Ammonia compounds of the present group are therefore among the best antispasmodics. They are useful remedies for children, especially for infants, who are frequently tormented by colic or flatulent distension of the intestines brought on by bad feeding.

These preparations may be profitably employed in the after stages of diarrhœa, after the removal of the exciting cause, when the mucous membrane continues to pour out a watery secretion, which perpetuates the diarrhœa.

The alkaline preparations of ammonia are employed, as has been said, in flatulent distension of the stomach and intestines. Their mode of action may depend in part upon their power of absorbing some of the excess of gas present, that part, viz., which consists of carbonic acid, but they will act chiefly by exciting the muscular coat of the intestine to contract, and so expelling the distending gases.

In full dose, these remedies excite an increased formation of mucus, in very full dose they cause vomiting; as emetics, they belong to the stimulant class, and often they act without inducing nausea or depression. They are seldom employed alone, but are often used to counteract the depressing effects of other emetics.

If administered too long, they excite catarrh of the stomach and intestines.

These substances readily *enter the blood*, and must to some extent

increase its alkaline reaction, but owing to their volatility an
diffusion-power, they are rapidly eliminated, and they exert t
only a transient action on the blood and the organs of the body

Feltz and Ritter find that toxic doses prevent the respirator
tions of the blood, and hinder the oxidation of the red cor
which will not absorb oxygen even when the blood is shaken
it; ammonia acts in this respect like many other substances.

Large doses injected into a vein excite tetanic convulsions
origin.

In experiments with the detached frog's heart, fed with an
circulation, Dr. Sainsbury and I found that ammonium salts,
doses, increased the strength of the ventricular contractions,
larger doses destroyed muscular contractility. Spontaneous
however, continued till contractility was lost; in the end sta
was no response, even when the ventricle was strongly sti
Ammonium salts acted nearly as powerfully as potassium
paralyzants of the cardiac muscular tissues, but they did not
the spontaneous rhythm, and in this respect differed strikin
potassium salts, and still more strikingly in that *they showed a*
stimulation preceding the paralyzant action. It is this s
stage which for the most part we seek therapeutically, but
not forget that too large a dose of ammonia injected directly
circulation of warm-blooded animals may arrest the heart at

In therapeutic dose ammonia induces a slight increase in
of the pulse, some excitement of the brain, and a general ser
warmth. Being a slight stimulant of the heart, ammonia is
fainting and exhaustion. It is frequently administered as
spasmodic—an action depending probably, in part, on its
strengthen the heart's action; like all other antispasmodics,
ence is brief.

Carbonate of ammonium is often employed as a stimulatin
torant in chronic bronchitis, when the expectoration is pro
the patient's strength is diminishing. It is often given with
of ammonium, which probably acts in a similar manner. C
of ammonium is frequently of signal service in severe bronchi
the broncho-pneumonia of children, especially when they are
and livid from obstructed breathing. It is probable that the
acts, in such cases, as much or more by stimulation of the re
centres and circulatory system as by its influence upon the
tory mucous membrane.

Carbonate of ammonium is largely used in typhoid conditio
erysipelas, or to the other acute specific poisons, as in pyæmi

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[1] In severe collapse, from any cause, the liquor ammoniæ (the we
paration), diluted once or twice, may be thrown directly into a vein,
being taken not to inject air. One drachm of the liquor ammoniæ
be injected. This treatment has been advocated strongly by Half

ιte of ammonium, and, in a less degree, the citrate and ammonium, produce perspiration. A small dose, one or ȝ of the carbonate, given hourly, will generally produce per- and as abundantly as either aconite or tartar-emetic. Car- ımmonium is one of the most certain and efficient diaphoretics diseases.

ɩeen maintained, without much show of proof, that carbonate ium is the poisonous agent in uræmia; the urea, it is said, s in the blood, forming this carbonate, which then produces ıs symptoms constituting uræmic poisoning. The general ·esent is that there are several poisonous principles at work ı.

.te of ammonium, in three to five grain dose, administered, ɔd with any other drug, hourly, or every two or three hours, to the severity of the case, has been much lauded in scarlet was used largely by the late Dr. Peart, who "did not lose ıt out of nearly three hundred." The late Mr. Wilkinson yed it with equal success; and recently Mr. Charles Witt ın a pamphlet extolling its virtues. It is said to be useful ıs of scarlet fever, especially when given early. The imme- :ts are stated to be diminution of heat, fever and delirium, ɩosition to sleep. Mr. Wilkinson says it is equally useful in nd that the ammonia treatment leaves no secondary evils. ɔd this treatment to a considerable extent in measles, and ʳ with considerable benefit. Carbonate of ammonium in- perspiration, and appears to develop the rash and cause the run a benign course. Mr. Charles Witt says that care ɜd that no acid drinks or acid fruits of any kind are taken, ɩ ammonia, by becoming neutralized, will lose its efficacy. ɔf the acetate of ammonium, and of the citrate of ammonium, . diaphoretics, and are very much employed in fevers. ɜspecially useful in the milder forms of fever, in particular catarrh.

.ose of acetate of ammonium, Mindererus' spirit, will often, teady and sober a drunkard.

posed effect of ammonia in preventing iodism is noticed in ace.

to its high diffusion-power, ammonia escapes very readily body in various ways, a portion passing with the breath, ıbly with the sweat, and much with the urine. It would

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f snake-bite, and though its efficacy has been doubted by Fayrer it may be tried. Halford's recommendation is, twelve minims of ammoniæ fortior diluted with three times its volume of water. .ould be exposed before injecting. (*See* Murrell's *Cases of Poisoning.*) ı in any other form of collapse, it may be necessary to repeat the ne or more times.

appear that some of the ammonia administered is built up in the system into urea, and escapes in the urine in this form. Some is perhaps oxidized and appears in the urine as nitric acid.

The taste of carbonate of ammonium is much masked by administering it in milk.

Mixtures containing ammonium carbonate or hydrate do not keep well in hot weather.

MAGNESIA, LIGHT MAGNESIA, CARBONATE OF MAGNESIA, LIGHT CARBONATE OF MAGNESIA, SOLUTION OF CARBONATE OF MAGNESIA

THESE substances, having an alkaline reaction, might have been placed in the potash and soda group, but the effects of the magnesia compounds on the body are, in many respects, very different from those of the potash and soda group. We have elsewhere treated of the properties pertaining alike to all alkaline substances, including, of course, the members of this group. (*See* Potash group.)

Taken internally, some of the oxide or carbonate of magnesia will combine with the acids of the gastric juice, and become soluble; the remainder, being unaffected, will be left insoluble. The part of the carbonate thus decomposed by the acids of the stomach will set free its carbonic acid.

These substances acting as antacids are used as antidotes, in poisoning by the strong acids and by some metallic salts; in all cases of corrosive poisoning the oxide, not the carbonate, should be administered. The special advantages of the members of this group are:—(1) their large saturating capacity for acid; (2) their purgative powers; (3) their harmlessness when given in excess. Their disadvantage consists in their bulkiness.

The oxide or carbonate of magnesia is generally used as an antacid, but the oxide is preferable, since the carbonate, by giving off much gas, may produce disagreeable distension of the stomach. It must not be forgotten that, used thus, they are merely palliative remedies, and that acids are far better correctives of acidity of the stomach. (*See* Acids.)

The oxide of magnesia precipitates many metals from the solutions of their salts, rendering them thus less poisonous. The magnesias form insoluble compounds with arsenic, and thus take rank among the antidotes of this poison.

The magnesian compounds of this group combine in part with the acids of the gastric juice. The oxide and carbonate, on account of their insolubility, cannot as such pass into the blood, nor does the chloride, though freely soluble, become absorbed in any amount ause of its low diffusion-power. Hence, almost all the magnesia ested passes on into the intestines.

n the intestines, the salts of magnesia undergo changes according their composition. The chloride is probably decomposed by the aline bile, and the oxide re-precipitated, part of which oxide may bine with the biliary acids. The residual oxide, whatever its origin, now converted first into carbonate, then into bicarbonate by the bonic acid of the intestines, and so is made soluble, and capable acting as a purgative. The carbonate will be changed by a single p into the bicarbonate, and it, likewise, then becomes a purgative. us these compounds will act as purgatives only after conversion o bicarbonates, in which form they will possess most of the pro- rties of the group of salts which includes sulphate of magnesia d other neutral magnesian compounds. Like the members of this ter group, the bicarbonate has a very low diffusion-power, and, e them, it is purgative; its action in this respect being very mild, is termed a laxative. The mild action of the oxides and carbo- tes, their freedom from taste, and antacid property, fit them ad- rably for children. They are generally combined with a little ubarb, as in the well-known Gregory's powder. If unduly employed ey occasionally accumulate, and may form concretions in the intes- es. These concretions consist mainly of the unaltered carbonate or de, of administration, for only a very small proportion of any given lky dose will suffer the changes above described. Some phosphate y be present in the concretions.

Bicarbonate of magnesia, fluid magnesia as it is termed, is a useful l mild aperient.

Magnesia has been lauded in sympathetic vomiting, as in that of gnancy: in those cases, it is to be presumed, where the vomiting ends on excessive secretion of acid from the stomach; its effects, wever, are very transient. Should it fail, recourse may be had to late of cerium (one grain every three hours), ipecacuanha, quinine, ds, etc. (*See* Ipecacuanha.)

The chief part of the magnesia passes out with the fæces, and, for reasons stated, a small portion only enters the blood. In excess uric acid, members of this group prove useful by saturating much the acid of the stomach, and carrying it out of the body.

LIME, CAUSTIC LIME, LIME-WATER, LINIMENT OF LIME, SACCHARATED SOLUTION OF LIME, CARBONATE OF LIME

THIS group contains highly valuable medicinal substances, which might with advantage be more extensively used.

Lime is a necessary constituent of the hard and soft tissues of the body, of bone, and the parts more vitally endowed, such as the nerves and muscles. Wherever there is active growth, whether natural or unnatural, lime salts are found in excess, probably in combination with phosphoric acid, this combination being in all likelihood the form of lime required by the body for the performance of many of its functions. In practice, we find that, in almost precisely the same morbid states in which the phosphate is found to be so valuable, other salts of lime will do equally good service, and it seems therefore likely that a portion at least of these other lime salts becomes united in the body with phosphoric acid.

The importance of lime is well shown in its influence on a cardiac contraction. Without lime it is probable that no contraction can occur. If too little lime is present the contraction is weak, but if a full physiological quantity is present in the fluid circulating through the heart the contraction becomes complete.

Lime also plays a very important part in the clotting of blood, an act having many features in common with the temporary hardening of muscle in the act of contraction. Lime salts have been shown to accelerate or even to start, in fluids poor in ferment, the act of clotting. (*See* Hammarsten, Green, and a Paper by ourselves, ***Journal of Physiology***, vols. 11 and 12.) In two or three unpublished cases of aneurysm at the Royal Free Hospital we applied lime chloride to the cure of the aneurysm in the hope of increasing the clotting within the sac; in one case a rapid cure set in almost immediately after ***suspending*** the administration of the lime salt.

To Professor Wright, of Netley, is due the credit of the proposal to use lime salts, in particular the chloride, in the treatment of hæmorrhages and hæmorrhagic states, *e.g.* hæmophilia, also in aneurysm. Wright draws attention to an important point in connection with this use of lime, viz., that the lime does not maintain indefinitely the increased coagulability *even though the dosage be continued.* His observations seem to indicate that for three or four days, at least, the coagulability is increased, but may then decline even to subnormal. This would suggest that in aneurysm lime salts may not prove very serviceable, but in hæmorrhage a less time than three or four days may do all that we require. The dosage cannot be considered to have been fixed, yet it may be placed for the present between 15 and 45 grains twice or thrice daily for three or four days only at a time.

The salts of lime having a very low diffusion-power, and but little ity for animal structures, they produce when applied to the skin little change, with the exception of caustic lime, which having a ng attraction for water, will withdraw it from the dermis when ived of its cuticle, and so to some extent effect the destruction of tissues. Yet, even here, as its diffusion-power is slight, it fails enetrate the tissues, and its action is therefore superficial. Caustic is not often used alone as an escharotic, but mixed with caustic sh, it forms a compound less deliquescent and penetrating, and far more manageable and safe than simple caustic potash; this s especially in affections of the neck of the uterus, as first pointed by Dr. Henry Bennet.

pplied to the broken skin and to sores, the carbonate of lime and e-water are slightly astringent, hence lime is sometimes used to ck the discharges from sores and inflamed surfaces.

ime-water and oil in equal quantities, or in the proportion of four lime-water to one of oil, enjoy a high reputation in the treatment burns.

Lime-water is of service as a lotion for cracked nipples.[1]

Lime-water is sometimes employed to check the abundant oozing m the surface in certain skin diseases, such as eczema; it is like- se a sedative to the smarting and tingling present in this affection. hen later, the inflammation of eczema having been subdued, the charge is still great, lime-water and glycerine form a useful and nforting application.

arbonate of lime is sometimes used as a dusting powder in eczema intertrigo; it serves to absorb the abundant secretion, to prevent discharges from irritating the already inflamed skin, and to protect skin from the air. In common with other dry powders, carbonate ime is inferior in most cases to some simple, bland, or but slightly nulating greasy application. Certain cases, however, are certainly re benefited by such dry powders, as the oxide of zinc, insoluble ts of bismuth, and carbonate of lime.

n the intertrigo of the buttocks and perinæum of young children, bonate of lime protects the skin from the irritation of the urine of the air, but greasy applications afford a more efficient protection, e the powder readily absorbing discharges holds these and becomes lf a source of irritation to the skin, at the same time that it tends ake and crack, and leave parts of the surface exposed to the air. best treatment here consists in frequent ablutions with soap and er, and the anointing with greasy applications, such as boracic

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To prevent cracked nipples is far better and much easier than to cure them. ediately the child is removed from the breast, the nipple should be care- y washed and dried. The nipples may be hardened by washing them some t time before delivery, and after each suckling, with a little brandy and er. A zinc shield worn constantly over the nipple is both healing and ective.

acid ointment. Much more important, however, is the
this condition by strict cleanliness and the frequent re
napkin, as often indeed as it is wetted.

On account of its astringent quality lime-water is use
in discharges from the ears, also in discharges from the v
an injection in gleet; it is of most service when some acti
inflammation is still present. In the *chronic* stages of e
is far inferior to the glycerine of tannic acid and other m
astringents.

Lime-water, probably owing in part to its alkalinity, is
as an injection in leucorrhœa.

Dr. Joseph Bell recommends lime-liniment to preve
pitting. Cotton-wool cut into proper shapes is dipped in
and applied so as to cover carefully the face and neck, l
tures for the eyes, nose, and mouth. No crevice is to be
a large handkerchief must be tied over all; the dressing s
on until convalescence.

Chalk makes a good tooth-powder on account of its so
safer than powders consisting of hard and angular partic
wearing away the enamel lay bare the dentine.

In inflammatory and ulcerative diseases of the mout
is occasionally used to lessen the discharges, and to prom
Solutions of lime, *e.g.* lime-water, will dissolve false me
as diphtheritic membranes. We may use either lime-wa
the following formula:—Slaked lime half an ounce, g
ounces, water eight ounces; it should be used as a spra
Though strongly recommended by several excellent aut
treatment of diphtheria is of doubtful efficacy. It has
mended also in plastic bronchitis.

In the stomach, lime preparations neutralize the aci
antacid other remedies are mostly to be preferred. Salt
specially useful in oxalic acid poisoning because the oxal
insoluble, but they are useful also in other forms of acid

It is not easy to indicate precisely the therapeutic v
water in vomiting, but in some forms of it few remedi
efficacious. It is serviceable in chronic vomiting gene
often arrests the vomiting from chronic ulcer of the
should be mixed with milk, either in the proportion of eq
of one of lime-water to four of milk; if the vomiting is i
patient should be fed upon this only, administered f
small quantities of, say, a tea- or tablespoonful. Young c
eject much of their milk in lumpy masses; similar mass
pass on into the intestines, and escape with the motions, ca
transit much wind and severe colic. Cow's milk is apt t
condition, the gastric juice coagulating it in lumps, wherea
coagulates human milk in fine flakes. Lime-water, by pr

lumpy coagulation, checks this kind of vomiting, generally at once; should it continue, however, the rejected milk is found to be no longer curdled.[1] Where there is constipation, bicarbonate of soda should be substituted for lime-water. Lime-water in the proportion of one eighth part is generally sufficient for these purposes, but this failing, a larger proportion, even up to equal parts, should be tried. Half a drachm to a drachm of bicarbonate of soda to a pint of milk may be substituted as above. Both of these remedies sometimes fail, and it may be necessary for a time to withhold milk altogether, and to feed the child on sopped bread, water gruel, and chicken or veal broth.

This vomiting occurs in the early months of life, sometimes even during suckling. If the child is brought up "by hand," it is important that the milk, if cow's milk, should be sufficiently diluted; during the first month the dilution should be with at least an equal quantity of water, some authorities indeed advise two parts of water to one of milk, the relative quantity of milk being increased as the child grows older. A child a month old may take a pint to a pint and a half of this diluted milk.[2] Dr. Meigs, of Philadelphia, recommends as an excellent food for healthy children, but especially for those suffering from the kind of vomiting under consideration, the following formula:—Soak a scruple of gelatine in a little cold water for a short time, and boil it in half a pint of water till it is dissolved, that is for about ten or fifteen minutes. Just before finishing the boiling, add milk with some arrowroot made into paste with cold water, and afterwards some cream. The proportions of the milk, cream, and arrowroot depend on the age of the child. For an infant less than a month old he advises three to four ounces of milk, a teaspoonful of arrowroot, and half an ounce to an ounce of cream to half a pint of gelatine-water; for older children the milk may be increased to half or two-thirds the bulk of the gelatine water. The gelatine and arrowroot prevent the lumpy coagulation of the milk, at the same time the small quantity of arrowroot will not disorder the stomach. If even this food is rejected, then the milk should be diluted with three or even four parts of a very thin decoction of arrowroot or barley water, or cream and water alone may be tried, one part of cream to three or four parts of water. The food consisting of milk, cream, arrowroot, and gelatine-water is very useful in diarrhœa.[3]

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[1] We have shown that lime salts in sufficient quantity promote the coagulation of milk, but there is no reason to consider that lime-water which is actually poorer in lime salt than is milk can act in any sense thus. The alkalinity of lime-water is probably a prime factor here. (See *Journal of Physiology*, vol. 11, 1890.)

[2] Barley-water may often be substituted with great advantage for plain water as a diluent.

[3] The subject of infant feeding has been much advanced of late by the use of the so-called "humanized milk," *which can* be obtained from some of the

Again, in young children suffering from chronic vomiting and diarrhœa, and consequent wasting, lime-water is often of great benefit, improving digestion, and apparently assimilation, and obviating that highly-irritating state of the urine which so commonly occasions intertrigo.

Solutions of these salts pass but slowly into the blood, on account of their low diffusion-power, and the greater part pass through the intestines, and are ultimately voided with the fæces.

These substances neutralize any acid present in the intestines, and check the secretion from the mucous membrane; sometimes by one or other means, sometimes by both, they thus act efficaciously in diarrhœa. Carbonate of lime, and in a less degree lime-water, deservedly hold a high place among remedies for diarrhœa in the later stages, when the irritant is got rid of. Common chalk mixture is useful also in diarrhœa depending on more serious causes, such as ulceration in phthisis or typhoid fever, but in these graver cases other remedies are to be preferred.

It has been said of the saccharated solution of lime that it does not confine the bowels, but on the contrary relieves constipation; it should not be taken on an empty stomach, lest it excite nausea.

Lime-water is a useful injection to destroy the thread-worms which infest the rectum.

From their low diffusion-power, only a small quantity of these substances passes into the blood, so small, probably, that it may well have been doubted if such can in any way influence the organs remote from the intestines. But experience has shown that lime-water or carbonate of lime is a valuable remedy in deficient nutrition, and in convalescence from serious disease, its good effects being most marked in children, suffering from rickets, mal-nutrition, etc. In some instances, doubtless, these good results are traceable to the local action of the lime salts on the mucous membrane of the intestines. The action of these salts, however, being very similar, although inferior, to that of phosphate of lime, we must refer our readers for the further consideration of this subject to the section which treats of that salt. One point may be noticed here, confirmed both by theory and experience, viz., that small doses will do as much good as large ones. This must mean that even our small doses, so-called, are far in excess

first-class dairies, or with a little trouble can be prepared at home. According to Frankland's formula this is done by separating the cream from one-third of a pint of milk, and then the curd by means of rennet; on breaking up the curd and boiling, the casein can be completely separated from the whey. In the hot whey 110 grains of sugar of milk are dissolved, and this, together with the cream, is then added to two-thirds of a pint of fresh milk. The milk should be used within twelve hours of its preparation. (Burney Yeo, *Food in Health.*) The sterilizing of milk is another important mode of treating it with a view to avoiding irritation of the alimentary tract.

ter is reputed to be useful in whooping-cough, and this e, on account of its astringency, for in certain forms of this ringents, such as alum and tannin, effect often a decided nt.

ion of a saline fluid has saved several lives in danger from e of hæmorrhage. Death in these cases seems to be due to e of too small a quantity of fluid in the vessels and in the latter organ being insufficiently distended to contract upon its contents and to propel enough fluid. This lack of f bulk, can be supplied by a saline fluid (Goltz, Kronecker, s much as two pints should be injected. The injection reciousness, and removes convulsions, the pulse at the same greatly in strength and falls in frequency. I have already ention to the influence of lime on cardiac muscular contracsame holds good probably in respect of other muscles. I gest then that the saline injection should contain a lime ably lime phosphate, which is quite sufficiently soluble to quantity needed to sustain the contraction of the cardiac

PHOSPHATE OF LIME

s of very great importance, both in health and disease. It nked among the most valuable and necessary foods, being s essential to proper growth and nutrition as the nitrol fatty compounds. Observations have proved abundantly ogical importance. It gives solidity to the skeleton, and intentionally fractured united more quickly when the animals were supplied with phosphate of lime.

The cardinal importance of this essential food to the soft and growing tissues is that of a promoter of cell-growth and nutrition; and that this is a very probable conclusion the following considerations tend to show:—

1. The presence of this salt throughout the body.

2. Its presence in much larger proportion in the intercellular fluid of the body than in the blood itself.

3. The fact that in herbivora the intercellular fluid is as rich in this salt as it is in carnivora, though the vegetable-feeders take so little of it in their food; it must hence be carefully retained in the intercellular fluid for some important purpose.

4. Smith's observations which show that a certain quantity of phosphate is required to supply the first basis for the new tissues, even in the case of those organs which subsequently exhibit an excess of carbonate of lime, as the shells of animals; an observation showing that phosphate of lime is necessary to initiate growth, and that, in this respect, it is not interchangeable with the carbonate.

5. The fact that wherever cell-growth is active, there phosphate of lime is in excess—a statement holding good both with regard to healthy and to diseased growths, for this salt is found to prevail in disease associated with rapid formation.

With regard to the second and third points, it must be borne in mind that phosphate of lime is soluble in acids, and, inasmuch as the intercellular fluid is acid, we should expect that the phosphate might accumulate in it.

Theoretically, then, it might be supposed that abundant data exist to enable us to forecast the occasions when to employ this salt remedially; thus it would be naturally assumed that in defective nutrition, or deficient cell-growth, the phosphate of lime should prove serviceable. Certain objections have, indeed, been urged against the employment of this salt in such conditions; for instance, it has been said, the fault is not really due to deficiency of lime, but inheres in the tissues, which fail to assimilate it, seeing that in cases of defective cell-growth and of mal-nutrition, the quantity of the phosphate in the urine is often unusually great. This being so, our efforts should be directed to the removal of the circumstances which check assimilation, for it would be as little reasonable to treat a diabetes mellitus with sugar as a diabetes of phosphate of lime with phosphate of lime. Some truth no doubt there is in these strictures, and too much attention cannot be paid to the hygienic conditions favourable to assimilation—good air, abundant light, and sufficient exercise, but the case before us is more analogous to anæmia than to diabetes, and we give iron with decided benefit in anæmia when this condition is due, not to want of iron in the food, but to the on-assimilation of it by the tissues. The efficacy of phosphates, owever, must be decided by experience, and experience speaks abundantly in their favour. Beneké, to whom on this subject we owe much of our knowledge, both physiological and therapeutical, has shown that phosphate of lime is especially useful in those very diseases in which it occurs in excess in the urine, such as hectic and chronic wasting disease.

This salt is of great use in the anæmia of young and rapidly-growing persons, and in the case of women weakened by rapid child-bearing, prolonged suckling, or excessive menstruation. In checking chronic tubercular and non-tubercular diarrhœa, and other profuse discharges, such as leucorrhœa, chronic bronchitis and the discharge from large abscesses, it is a valuable remedy, effecting in these states both general and local improvement. Beneké speaks highly of its influence on scrofulous sores. It is useful also in caries of the bones.

This salt is apt to be deficient in town-dwelling women, who improve under its administration; under such treatment an increased quantity of the salt finds its way into the lime-lacking milk of a suckling mother, who, together with her child, is thus simultaneously benefited.

Persons in broken health from prolonged town life or overwork, or who from other causes are languid, hipped, and incapable of much exertion, often derive much benefit from this medicine. In cases such as this, a good formula is: phosphate of lime, phosphate of iron, and carbonate of lime, of each, one grain; phosphate of lime, however, will act admirably by itself. This medicine is useful in the chronic forms of phthisis with little or no fever. It should be taken on the tongue either dry or mixed with a little milk.

No reasonable doubt can, I think, be entertained of the efficacy of phosphate of lime in many cases of rickets.

It has been sought to establish a connection in all cases between rickets and a deficient supply of lime; in evidence of this it is urged, firstly, that rickets occurs commonly during the first dentition, when much lime is required by the growing teeth, and, secondly, that rickets affects the children of mothers who are in just that state of ill-health in which it has been established that the milk is deficient in lime. There may be much truth in these statements, but, as in many cases of rickets an excess of lime is found in the urine, the disease in such cases cannot be held to depend on a deficient supply of the salt, but must be due to other circumstances, of which, at present, we are only partially cognizant. In cases where the disease is dependent on deficiency of phosphate of lime, its administration is obviously all that is required.[1]

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[1] A deficiency of lime and phosphoric acid in food does not produce in animals the changes characteristic of rickets, though the bone becomes fragile.

In rickets, further, there is not merely deficient ossification of the bones, but unnatural growth and defective nutrition, both in the skeleton and in the other textures. The phosphate of lime appears to control this defective and perverse nutrition, and to induce healthy growth, so as not merely to favour the consolidation of the skeleton, but to improve the condition of the soft organs, and experience shows abundantly that many rickety cases are benefited more decidedly by lime-salts than by any other single drug.

German authorities, who have studied this subject most attentively, consider that the fittest time to give this remedy is after the cessation of the active stages of the disease, that is, when the pains and tenderness of the bones have disappeared.

It is well to repeat a caution against the uselessness of administering this or other lime-salts in large quantities, for, owing to their very low diffusion-power, very little passes into the blood. A grain, or two grains, several times a day, is a sufficient dose. Given in excess, it hinders digestion.

Phosphate of lime in the stomach must be variously affected by the free acids, since lactic, hydrochloric, and, in a lesser degree, acetic acid, dissolve it, forming the soluble superphosphate.

Most of the phosphate passes on into the intestines, where, if the salt is too long administered, it is liable to form concretions. Being unaffected by the pancreatic and biliary secretions, and but slightly soluble in the intestinal juice, most of the phosphate passes off with the stools. There will probably be a reprecipitation of the neutral tricalcic phosphate, from the acid solution which some of the phosphate will have undergone in the stomach.

Phosphate of lime is highly recommended in various forms of chronic diarrhœa, and especially in that of young children, to whom it may be given with carbonate of lime and lactate of iron. Whether the beneficial effects are due to its direct action on the mucous membrane, or take place after absorption, in the manner previously described, our present knowledge does not enable us to decide.

Being soluble in the acids of the gastric juice, and to some extent in solutions of common salt, its passage into the blood takes place, probably, in several ways. It has, however, been doubted whether any portion, if uncombined with food, passes into the blood, since no augmentation of this salt is met with in the urine during its administration; nay, in some cases it seems even lessened. The observations on this point are, perhaps, too scanty to set the question at rest.

Much phosphate is taken, either in combination with the food, or so intimately blended with it that it is well-nigh impossible to separate it from the tissue-forming substances, and thus it finds ready entrance into the blood, with the digested materials; this is the chief, and, in ordinary cases, the only source of phosphate of lime for the supply of the system. That so alkaline a fluid as the blood is capable of dissolving the phosphate is explained by the solubility of this latter in solutions containing free carbonic acid or common salt.

The subject of the part played by inorganic lime salts in the treatment of diseases marked by mal-assimilation is rather intricate and needs further elucidation; it stands *theoretically* very much in the same position as the question of iron administration in anæmia. In any case, however, when we administer a lime salt for the sake of its lime, we must not forget what Bunge says as to the relative richness in lime oxide of the solution of lime-water and cow's milk. There is less lime in a saturated solution of lime in water than in milk itself, in the proportion of 13 to 17. The futility of the addition of a few teaspoonfuls of lime-water to milk will at once be apparent if the plea for the addition be to increase the dose of lime.

HYPOPHOSPHITE OF LIME, HYPOPHOSPHITE OF SODA

DR. CHURCHILL recommends these drugs in phthisis, and his statements regarding their action have for the most part been upheld by Dr. Thorowgood and some other observers.

Dr. Churchill commences with a grain, and increases the dose to six or seven grains a day, giving it in the form of syrup or pill. Dr. Thorowgood gives a grain three times a day in the form of syrup. In too large doses the hypophosphites may produce weakness, sleepiness, headache, giddiness, noises in the ears, loss of appetite, colic, diarrhœa, and even bleeding from the nose and lungs. Dr. Churchill administers these agents uncombined, and cautions against giving them with iron, cod-liver oil, or stimulants. It is said that, in phthisis, the hypophosphites increase appetite and improve the digestion, promote the formation of the blood, lessen cough and expectoration, relieve pain in the side, and diarrhœa, and often effect a cure. They are said to be more useful in the first than in the second stage, in the second than in the third stage, and in those cases where only one lung is affected—statements sufficiently obvious and applicable indeed to every remedy. Thorowgood says they are more successful with young than with old people. These remedies are to be recommended also in nervous and general debility; teething; spermatorrhœa; chlorosis; and anæmia.

Chemically the hypophosphites are nearer to free phosphorus than are the phosphates, and their mode of action seems, in accordance with this, to resemble somewhat the action of free phosphorus. They are generally regarded as alteratives in the same sense that phosphorus and arsenic are alteratives, and they are prescri in states of general debility and lowered tone. In phth much employed for these general effects rather than fo powers. The dosage may certainly be carried conside the doses above given—five or ten grains being ofte beneficially, thrice daily. Nor does present practice Churchill's caution against combining them with iron, or stimulants, for a very favourite prescription is th Fellows' syrup, and in this we find the hypophosph quinine, strychnine, sodium and manganese: each drach contains one sixty-fourth of a grain of strychnine. Agai method of prescribing the hypophosphites with cod admittedly good practice.

CHLORIDE OF POTASSIUM, CHLORIDE OF CHLORIDE OF AMMONIUM

THESE substances, having many chemical and therape in common, have been grouped together, but the rem section will refer mainly to chloride of ammonium.

The salts are freely soluble, and they possess a hi power. The saltish taste common to them all is, in the ca of ammonium, somewhat disagreeable, and constitutes objections to its use. They increase considerably the s the mucous membranes, and may indeed even excite cata notably the case with chloride of ammonium, which is much employed when it is proposed to influence the r branes.

How do these chlorides promote the formation of mu take the instance of common salt. Chloride of sodiu constituent of mucus, and hence when salt is taken int it is likely to promote the production of those secretio is so large a component. It is, indeed, to be regarded the mucous membranes. This suggestive hypothesis apply to the case of other members of this group.

Common salt is used to produce sickness, or to prom of other emetics. Two tablespoonfuls in a half-pint stitute an emetic dose. Given in poisoning by nitrat effects a double decomposition, precipitating the silver as insoluble chloride.

Dr. Rutherford's experiments upon fasting dogs lead conclusion that common salt increases very slightly of bile.

Owing to their high diffusion-power, these salts pass the blood, hence they will travel along the intestines ıs. It is indicated in bronchitis when the secretion is thick lant, and in this affection may also be applied topically to d mucous membrane of the respiratory tract by the atomizer. be given in twenty-grain doses every three or four hours, in ıtill better, in a mixture containing a drachm of the liquid liquorice in each dose; by freely diluting this dose with shall succeed in concealing the disagreeable taste of the The same remedy has been lauded in whooping-cough.

lso recommended in catarrhal jaundice, and it appears to ıseful in the congestive stage of cirrhosis. In India it is largely in hepatic congestion and hepatic abscess.

id to be successful frequently in removing the pain of facial "of rheumatic character." It should be given in half-ıses, and if, says Sir T. Watson, four doses fail to give relief, may be considered unsuitable for the case. In full dose, mes a day, I have many times found it useful in facial Dr. Anstie speaks well of it in migraine, clavus, myalgia, l and hepatic neuralgia, and in mild forms of sciatica.

loctors employ this salt in all forms of neuralgia, and I d some eminently practical men go so far as to assert that ıinful affection they require no new remedy, since chloride ium in half-drachm dose, repeated several times a day, so s to give relief.

ɜ of ammonium is given with advantage in headaches due hagia, amenorrhœa, etc.

ı salt sometimes arrests hæmoptysis. For this purpose ıpoonful should be taken undissolved, and be repeated occa-

The saline springs taken internally exert powerful alter and are much prescribed in chronic rheumatic states catarrhs of the alimentary and respiratory tracts. Abroa of Wiesbaden, Baden-Baden, and Homburg are of this cla

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Group containing SULPHATE OF POTASH, SUL SODA, SULPHATE OF MAGNESIA, PHOS SODA, TARTRATE OF POTASH, BITART POTASH, TARTRATE OF POTASH AND SOI

WITH the exception of the sulphate and bitartrate of substances are freely soluble in water. They have little for animal textures, and but little attraction for wate effect but few changes in the organic constituents of by direct contact.

The sulphates have a very disagreeable, bitter taste, is, in the case of the phosphate of soda, slight only, and possess little or none.

The whole group is purgative, producing watery eva while they all act as hydragogue purgatives, they exci irritation in the mucous membrane itself.

How do they produce their purgative effect?

Purgatives may act in one of two ways, or in both con will purge by increasing the moisture of the intestines, tating the passage of the contents along the canal; act by increasing the peristaltic action of the intestin contents are urged more rapidly towards the rectum; m will combine both actions, although one or other will dominate.

The watery character of the motions shows without part at least, these drugs purge by augmenting the m contents of the intestines—an augmentation effected i (*a*) by causing water to flow from the blood into the inte exciting the mucous glands of this tract to increased by effecting the retention of the water already present tines. Buchheim concludes, from his careful observatio salts purge solely in virtue of their power to retain in the water existing there, and that they produce no flow the blood, and no increased secretion from the muco evidence of this he points out that, after purgation wit cines, no albuminous substances are found in the fæces.

Thiry and Radziejewski conclude that these salts and tives act by increasing the peristaltic action, especiall intestine. On the other hand, Brunton has shown tha sulphate of magnesia does cause fluid to pass from the blood into the intestine, for when a solution of sulphate of magnesia is put into a knuckle of intestine secured at both ends, it is found that after some hours the contents of the tied-off portion are increased. Accepting this point as established, the question still arises as to whether this augmentation is due, according to the older view, to simple osmosis from the blood, or, as Brunton thinks, to stimulation of the mucous membrane of the intestine. When we bear in mind how an irritant like snuff or pepper applied to the nose and eyes causes a copious flow from these parts, we can easily conceive that stimulation may cause a copious outpour into the intestine. Moreau has indicated another possible explanation for the outpouring by showing that section of the intestinal nerves causes a free serous exudation into the intestine. It does not appear, however, that paralysis of these nerves will explain the purgative action of salines, for the stools provoked by salines do not contain albumen, as they would were the excess of water present due to serous exudation.

In an elaborate and valuable paper, Dr. Matthew Hay has re-investigated the mode in which saline cathartics act. His experiments show that saline purgatives act by exciting an increased secretion from the mucous membrane, chiefly of the small intestine, and not by stimulating the pancreas or liver to an increased secretion. This increase in the quantity of fluid in the intestine is a true secretion, and not an inflammatory exudation nor an osmosis, for the intestines are not congested, and the fluid in the intestines only contains a trace of albumen; further, the quantity of fluid in the intestines a short time after the administration of the saline is far too large, if compared with the quantity of salt absorbed, to be explained by osmosis. The saline passes rapidly along the small intestine to the colon, and almost the whole of the fluid contents reach the colon of a fasting animal within an hour. Food, probably, delays the passage of the fluid, and so weakens the purgative action. The saline is absorbed by the small intestine, but excreted by the colon, hence since the fluid is in largest quantity in the small intestine, becoming rather less as the contents pass downwards along the colon, the salt contained in this fluid will be less both in total quantity and in concentration in the small intestines, and *vice versâ* in the colon. The purgative action is not, however, caused by the secretion of the saline by the colon, for, when injected into a vein, sulphate of soda and sulphate of magnesia do not purge.

Matthew Hay finds that the absorption of these salts is very slow in the stomach, but rapid in the small intestines.

Magnesium sulphate is, he finds, much more poisonous to the respiratory centre and the heart when injected into a vein than sodium sulphate.

To sum up, these saline purgatives would appear to act, partly by increasing peristalsis, partly by increasing secretion, and partly also by hindering absorption on account of their low diffusion-power. This last action will hold specially for the magnesium sulphate.

Like other purgatives, these salts are used to evacuate the bowels, to remove water and poisonous matters from the blood, and to reduce blood-pressure. As simple evacuants in ordinary constipation, they prevent contamination of the blood by removing those alkaloids and other poisonous substances which are generated from the fæces in the intestine, and which give rise to a species of auto-intoxication.

Owing to the increased secretion from the intestines which they bring about, these salts remove impurities, such as those which occur in uræmia, jaundice, etc. Their use in cases of anæmia *with constipation* forms an important part of the treatment, and is to be explained as above by the prevention of the absorption of self-generated poisons within the alimentary canal.

An excellent way to administer some of these salts is in the form of the natural waters of Püllna, Friedrichshall, Hunyadi-János, or Æsculap water; these waters are given in doses varying from a wine-glassful to half a tumblerful or more. Usually, one dose before breakfast is sufficient, if not, a second, and even a third, dose may be taken in the course of the day. It is advisable to mix the natural water with a third, or an equal quantity of boiling water, for when taken cold, the water is sometimes liable to "lie heavy on the stomach." As a rule, a wine-glassful of one of these waters, with an equal quantity of hot water, is sufficient to open the bowels without much griping or pain. Püllna and Hunyadi-János waters are much more powerful than Friedrichshall.

A wine-glassful of Friedrichshall water in a breakfast-cupful of hot water is very useful in bilious sick headache. The best time is before breakfast, though it is useful at any time. It stays the nausea and soon relieves the headache, sometimes without purging. The taste of this mixture is not very disagreeable. Püllna or Friedrichshall water mixed with milk forms a good purgative for children, the milk disguising the bitterness.

Whilst upon this subject of the aperient action of salines, we may perhaps advantageously refer to some other yet simpler means of treating constipation—by the use, viz., of fruits and other articles of diet. An orange or two eaten before breakfast is a pleasant and often effectual way of overcoming moderate habitual constipation; sometimes, indeed, this plan overcomes the most obstinate forms. Another good means of obviating constipation is to take a glass of cold water before, and an orange soon after, breakfast, and if oranges before breakfast disagree, this is how they should be taken.

Stewed rhubarb, or stewed gooseberries, cooked or uncooked apples, are other effectual laxatives; grapes and strawberries, on the other hand, are often useless. Strange to say, we occasionally meet with people in whom fruit causes constipation. More often we see individual peculiarities in respect of fruit; thus, some are made bilious by oranges or strawberries, and again some are made constipated by strawberries, whilst by other fruits they are relaxed.

There are many persons, especially busy, worried men, whose comfort and well-being seem to depend on an efficient daily evacuation of the bowels. If these pass a day without relief of the bowels, or if the defecation is delayed to the after part of the day, they suffer from mental dulness and inactivity, a kind of fogginess, with much irritability, and perhaps a dull, "stupid headache." They are quite conscious of their irritability, but cannot well control it. Directly the bowels act freely, these symptoms vanish at once, the head clears, the spirits revive, the ill-temper disappears, full mental capacity returns; in a short time longer, perhaps half an hour or an hour, the headache also disappears. In the case of many such patients, the constipation is not obstinate; there is an action daily, but the hardened, dry evacuation is insufficient to give comfort. Dietetic means, such as porridge, brown bread, whole-meal bread, and exercise, are generally sufficient to overcome this constipation; if not, then fruit before or after breakfast should be tried, and this failing, the natural purgative waters will often prove most useful. In general, we should adopt this order in the treatment of constipation, viz.: first, diet and exercise; then the use of fruits and draughts of plain water; then aperient medicines.

To return to these, we have, in the Carlsbad waters, means which are eminently useful in many abdominal diseases. Sulphate of soda is the chief constituent of these waters, and magnesia is practically absent. The imported waters are especially efficacious when a dietary is adopted similar to that enjoined at Carlsbad. The water should be warmed to about 100° to 110°, and the patient should drink three to six tumblerfuls before breakfast, prolonging the drinking over an hour or more, and, if possible, exercise in the open air should be taken the while. Dr. Stephen Ward says, "Even when first taken, and in moderate quantity, they usually cause pulpy, slimy stools of dark colour and offensive odour. These stools are generally repeated frequently, and the patient is astonished at the quantity that sometimes comes away, but in many persons no very evident symptoms beyond the purgative action attend the drinking of the waters." I have rarely seen them purge, because, perhaps, I have used them chiefly in obstinate constipation. The quantity to be taken will depend on the effects. It is better to begin with three tumblerfuls, and gradually increase the quantity to four, five, or six, according to the result. This treatment must be continued for three weeks or a month. It often induces some weakness. It reduces stoutness, and sometimes even makes a patient very thin. But if it produce much depression, or excite nervous symptoms, a smaller quantity should be taken, and the course must be limited to a fortnight or three weeks. The good effects are sometimes not apparent till a week or so after the course has been completed. The diet at Carlsbad is extremely simple. "Fat, butter, cream, pastry, cheese, rich meats, such as pork, goose, sausages, salmon, mackerel, herrings, anchovies, made dishes, such as entrées and other dishes seasoned with spices, pepper, onions, garlic, etc., are to be avoided. Dressed salads, cucumber, and uncooked fruit, generally, are objected to as being indigestible, and likely to cause flatulence and irritation of the bowels. The use of spirits is absolutely forbidden, and the wine of the country or the lighter French wines are permitted only sparingly, and in cases especially requiring a certain amount of stimulation. The breakfast, which is usually taken about an hour after drinking the last tumbler of the water, consists merely of weak tea or coffee, with milk and a little sugar, and small, well-baked rolls, or second day's bread; meat, fish, or eggs are excluded, except for the very delicate. The dinner, which takes place at one, consists of but three courses: soup, free from grease and spices, and thickened with barley, rice, or vermicelli; meat, such as beef, mutton, lamb, poultry, or game, with well-boiled, fresh vegetables, and a light, simple pudding, or a compôte of stewed fruit; a cup of coffee may be taken in the afternoon; a light supper is taken at eight o'clock; and smoking in moderation is not objected to." (Dr. Stephen Ward.)

This treatment is extremely useful in obstinate habitual constipation, and by its means I have cured some of the most rebellious cases. In some instances it may not relieve the bowels for some days, indeed even a week may pass without relief; in other cases it at once produces one or two soft, copious, natural evacuations, and on discontinuing the water, the bowels continue to act daily. After some months, however, recourse to the waters may again become necessary, owing, generally, to some fault in the patient's habits. In cases of simple, obstinate constipation, it is not necessary to enforce very strictly the rigorous Carlsbad regimen just described.

Again, in cases like the following, Carlsbad waters are very useful: —A middle-aged woman, accustomed to eat and drink somewhat too freely, suffers from acidity, much flatulence, constipation with attacks of pain at the epigastrium, or over the liver, or between the shoulders, the conjunctiva becoming rather jaundiced, and the complexion sallow. In a case such as this, a well-regulated diet greatly assists the action of the waters. This treatment is also very useful in gall-stones and in gout. It is indeed the most successful treatment for the removal of gall-stones, and the prevention of their formation.

Patients sometimes say they have tried Carlsbad waters without good results, when they have simply taken Carlsbad salts dissolved in a small quantity of water. In this form also the salts purge, but they fail to yield the same excellent results as when given largely th water; I have no doubt that the large bulk of water minent part in the therapeutic effects.

ord, from his experiments on fasting dogs, finds that phosda is a powerful cholagogue, not merely emptying the galld biliary ducts, but actually increasing the secretion of bile. f potash and Rochelle salt he finds to be moderate cholat that sulphate of soda is only a feeble hepatic stimulant. say, he finds that sulphate of magnesia produces no effect r. It is interesting to observe that sulphate of soda is the dient in Carlsbad water, which is so largely used for its he liver.

tholow speaks highly of phosphate of soda in catarrhal a drachm three times a day for adults, ten grains for He commends it also in hepatic colic, to prevent the of gall-stones. In biliary colic the treatment should be n for several months. He also strongly recommends a dose ins several times a day in milk for the pasty white stools tioned children.

mbers of this group, such as sulphate of soda, bitartrate of l tartrate of potash and soda, because of their hydragogue largely used in general dropsy, both cardiac and renal. their action in greatly increasing the intestinal output of y lessen dropsy, and so free in some measure the waterans, removing thus many distressing symptoms. In the ght's disease, the fluid withdrawn from the blood by the ative holds in solution some of the deleterious matters which æmia, and, therefore, these purgatives purify the blood, and t in removing or preventing coma, convulsions, headache, tc. It must, however, be borne in mind that often repeated is weakening, and may, by increasing the anæmia, actually e dropsy.

gative action of these salts is most marked when they are ed in a concentrated condition, and Hay, therefore, advises of six drachms to an ounce of the sulphate of magnesia in of water before food, and he directs that there should be from fluids for some time afterwards. This treatment much water from the blood-vessels and speedily reduces of these salts upon the fever is indirect, and is due simply to the unloading of the bowels, since it is well known that constipation augments the preternatural fever heat.

For fever patients, Dr. Armstrong strongly recommended free purgation, to the extent of several evacuations daily, during the first few days, *i.e.* before exhaustion sets in. This treatment still finds favour with many practical authorities, although it is not approved by Dr. Graves. It has been stated that free purgation in scarlet fever will prevent severe sore-throat, glandular swellings, discharges from the nose and ears, and many other disagreeable sequelæ.

In measles, purgatives must be given with caution, the bowels being generally irritable, and diarrhœa often present.

Saline purgatives are of considerable value in hæmorrhage from the lungs. They act by freely removing fluid from the blood and at the same time by causing dilatation of the abdominal vessels; in these two ways they lower blood pressure.

On account of the low diffusion-power of these salts, very little passes into the blood, the greater part, especially when they purge, passing from the system with the fæces. Small doses, if they tarry long in the intestines, ultimately pass into the blood, and are separated by the kidneys. They are then reputed to act as diuretics. To this action we have already referred as an accompaniment of brisk purgation, but the action now spoken of appears to be independent of purgation. Thus the tartrates of this group in particular are highly esteemed as excellent diuretics in Bright's disease, and are often employed in doses short of purgative. These tartrates and bitartrates are converted into carbonates, partly in the intestines and partly in the blood. In this way they lessen the acidity of the urine, or even render it alkaline. Except in the case of phosphate of soda, the action of these salts on the constituents of the urine, either in health or disease, has not been worked out.

The salts of this group most frequently employed are the bitartrate of potash, sulphate of magnesia, and sulphate and phosphate of soda. The phosphate, well-nigh tasteless, may be given to children, unsuspected, in a little broth or in the contents of the infant's bottle.

Like other purgatives these salts often act more quickly and with greater certainty in small and frequently-repeated doses. Hence, when the bowels are tightly locked up, having resisted the action of a full dose of Epsom salts, it is good practice to give the same remedy in small and often-repeated quantities, such as a drachm every hour or two hours.

It should be mentioned that sulphate of potash must be given with some caution, for, although usually a safe and mild purgative, it has proved poisonous in some cases; potash salts, it will be remembered are far more poisonous than soda or magnesian salts.

NITRATE OF POTASH, NITRATE OF SODA

THESE salts possess a very high diffusion-power, and are freely soluble in water. They lower the temperature of water in the act of dissolving, an effect very considerably increased if sal ammoniac is mixed with the nitre. This combination of salts used to be applied to the skin as a refrigerator, but now is rarely so employed; it is to be especially avoided if the skin is broken, as solutions of the nitrate are very irritating to wounds. Ice is in every way a better refrigerator.

The inhalation of the fumes of burnt nitre-paper will sometimes avert the paroxysm of asthma. According to Dr. Hyde Salter this treatment is most effectual in pure uncomplicated asthma. He points out that the paper must imbibe neither too much nor too little nitre. If the bibulous paper is too thin, it absorbs insufficient nitre; if too thick, it takes up excess of nitre, and the fumes are moreover too carbonaceous, the paper burning too fast, and with a sudden explosive action. There should be no brown smoke, but clear white fumes. Red blotting-paper of moderate thickness and loose texture is the best to use. Dr. Salter gives the following directions for the manufacture of nitre-paper:—Dissolve four ounces of nitre in half a pint of boiling water; pour the liquid into a small waiter and soak the paper, then drain and dry it. Cut it into pieces four inches square, and when required burn one or two of these pieces, or a piece may be burnt nightly in the bedroom. The prepared paper must be kept in a dry place. In the Pharmacopœia of the Throat Hospital, Sir Morell Mackenzie gives the preparation of three papers of different strengths, one made from a solution containing sixty grains, another forty grains, and the third thirty grains of nitre to an ounce of water. He directs the paper to be cut into pieces three inches long and half an inch broad, and that one to six of these pieces be used, successively, at each inhalation. The paper is to be burned in a jar, and the fumes inhaled by taking deep inspirations from the fuming vessel. Various substances may be added to the solution which appear in some instances to heighten the effect of the nitre, such as compound tincture of benzoin, spirits of camphor, oil of cassia, and tincture of sumbul. It is a singular circumstance, affording a marked example of the "caprice" of asthma, that a paper prepared with nitre only will relieve one patient, yet will utterly fail to relieve another, although a nitre-paper prepared in a different manner may be quite successful. It must be borne in mind, therefore, that although one kind of nitre-paper has failed, it does not necessarily follow that another sort of nitre-paper will fail also. Sometimes a thin paper fails where a thick one succeeds, and *vice versâ*. It appears, indeed, that very slight differences in the mode of manufacture influence the therapeutic effects. Many quack papers said to contain other substances besides nitre, or besides nitre and chlorate of potash, often succeed admirably.

Recent experience on a considerable scale leads me to conclude that these papers would prove much more effectual if somewhat differently prepared, and if pieces were burned sufficiently large to fill the room with fumes. The most efficacious paper is to be made by dipping ordinary white blotting-paper into a boiling saturated solution of nitrate of potash and chlorate of potash. Paper thus prepared burns with a flame. A large piece, the size of course depending on the dimensions of the room, often succeeds when other prepared papers fail. A piece ten inches square may be burned; sometimes two or three such pieces will be required. In certain cases, when ordinary papers have failed, I have used, with advantage, a pastille compounded of two parts of nitre, one part of chlorate of potash, and two parts of lycopodium powder. Dr. Murrell uses with much success a thick paper soaked in a boiling saturated solution of nitre and chlorate of potash. This thick paper, made by the adhesion of six sheets during crystallization, contains, when dry, twice its own weight of salt, and a piece of paper six inches square takes up nearly half an ounce of the mixed salt. Certain cases require a greater quantity of nitre smoke than others. I am convinced that the reason why papers appear in so many cases to fail, is that they are not adequately impregnated with nitre, and are consumed too sparingly.

Crystals of nitre have a cooling saline taste, and in acute inflammation of the throat are sometimes sucked for this effect, but other remedies are preferable.

In large doses the nitrates inflame the stomach, giving rise to vomiting, diarrhœa, great weakness, faintings, loss of consciousness, and, in some cases, death. Even when taken in moderate quantities they may, if persisted in, disorder digestion considerably, producing nausea, vomiting, and a coated tongue, together with general languor of body and feebleness of pulse; their action consequently must be carefully watched.

From their high diffusion-power these salts speedily enter the circulation, and, unless large quantities are taken, they will pass but a short way along the intestines, and will therefore not purge; in fact, so far as we know at present, they exert little or no direct influence on either the small or the large intestines.

Much conjecture has been hazarded regarding the action of the nitrates upon the blood. It is well known that they prevent the coagulation of fibrin, in blood which has been withdrawn from the body, or, coagulation having taken place, dissolve the coagulum. Scherer, however, asserts that they will not dissolve the fibrin of inflammatory blood. These facts have led to the supposition that the nitrates may possess, during life, a like influence over fibrin in t [illegible] on, and that they are indicated when this substance is n excess, as, *e.g.*, in inflammations and in acute rheumatism. There is o proof, however, that the nitrates possess any such power over the ving circulating blood, nor, indeed, *unless employed in considerable uantity*, do they exert any appreciable influence upon fibrin after its withdrawal from the body. Hence it cannot be expected that after dilution with the fluids of the circulation, *small doses* will in any way influence the fibrin of the blood. Further investigation makes this notion no longer tenable, for it has been ascertained that blood withdrawn from the body, both before and after the administration of nitrate of potash, contains in each case the same quantity of fibrin.

These salts are considered to be highly useful in acute rheumatism, and are supposed to protect the valves of the heart, or to restore them to their natural state, when damaged by rheumatism—a supposition founded on a misapprehension of the morbid processes which lead to valvular obstruction and incompetency. These structural changes, it was imagined, resulted from the depositions of fibrin upon the surface of the valves, and it was thought that the subsequent contraction of this fibrin rendered the valves shrunken and inefficient; the truth being, that these changes in the valves are owing to inflammatory products formed within in their own substance. Occasionally, it is true, fibrin is deposited on the thickened and roughened valves; but even this, as has just been pointed out, these salts can neither prevent nor remove.

Whilst, then, it must be admitted that these salts do not act in the way formerly supposed, nevertheless many high authorities consider that nitre mitigates and shortens an attack of rheumatism. The advocates of nitre administer it in large doses, freely diluted with water, giving as much as half an ounce to an ounce of the salt during the course of the day: lemonade or barley-water, agreeably sweetened, is a good vehicle. Upon this treatment the urine, it is said, becomes very abundant, the fever declines, and the pains abate. At present there are no observations sufficiently exact to determine this point. Nitrates are now quite superseded by salicylate of soda in the treatment of acute rheumatism.

The same discrepancies of opinion prevail in respect of the influence of the nitrates on other acute inflammations.

These salts readily pass from the body, through the kidneys, in the urine; in their passage they may irritate and inflame the urinary organs, and in large doses may even produce hæmaturia.

Nitrate of potash has been recommended in the incontinence of urine of children.

In some quarters the nitrates enjoy a very high reputation as diuretics, and in certain cases they do appear to be of considerable service. Their diuretic action is well displayed in lumbago and chronic rheumatism, accompanied by a scanty high-coloured urine, becoming turbid on cooling. *Ten grains* of the salt dissolved in water, taken hourly or every two hours, will in some cases soon crease the urine, rendering it clear and limpid, upon which the rh matic pains will generally decline.

CHLORATES OF POTASH AND SODA

In many of its chemical properties chlorate of potash resemble preceding group of nitrates, and like them, it is endowed with diffusion-power; it differs, however, in the fact of its sp solubility.

A solution of the chlorate, used as a wash, is said to clean stimulate foul ulcers, but other remedies are more effective. Ha ounce to an ounce of a saturated solution of chlorate of potas containing five to ten drops of laudanum is very useful as an inj for inflamed and painful piles.

This salt appears to increase the flow of the saliva; accordi Hutchinson and others it tends to produce ulceration of the m membrane of the mouth. It is largely used in various affectio the mouth, and is of signal service in mercurial and simple saliv in ulcerative stomatitis and in aphthæ. It is particularly use that form of ulceration of the edges of the gums, which is gen limited to one side of the mouth, affecting both the upper and jaws, and also that part of the tongue and cheeks which com contact with the ulcerated gums. Although not at all dang this is often a very obstinate complaint, and especially in a though children are most prone to it. The influence of the ch on this form of ulceration is almost magical; in one or two d cleans the dirty-looking ulceration, and in a day or two more it it. It is also said to cure follicular and phagedenic ulceration charm. Dr. Lloyd Roberts says that chlorate of potash, taken nally, and used as a lotion, is useful in the teasing dryness mucous membrane of the throat which may be left after diph and scarlatina.

It has been largely used, and in full doses, in diphtheria, acute throat, and scarlatina.

Dr. Leonard Sedgwick speaks highly of chlorate of pota catarrh; he says it quickly relieves the stuffiness of the nos rawness of the throat, and thickness of the voice. Taken earl frequently, it will stop many a cold. Eight or ten lozenges be sucked in the twenty-four hours.

Some assert that the action of chlorate of potash is simply and they attribute its good effects to its topical application When administered by the stomach, however, it is largely ex e salivary glands, and hence, after absorption into the blood, its l action on the mouth and throat persists.

orate of soda is more soluble than chlorate of potash, and rs to be equally serviceable.

orate of potash seems to produce but little effect upon the ch, unless taken in considerable quantities, then, however, like trate, it inflames the mucous membrane, and produces both vomit- id diarrhœa. It is not employed in diseases of the stomach.

ing to its high diffusion-power it passes readily into the blood, ecause of its slight solubility, it is impossible for a large quantity s salt to find its way quickly into the circulation. Nevertheless, proved poisonous, especially in children. In poisonous doses, is half an ounce for an adult, it inflames the gastro-intestinal and excites, as has been stated, violent vomiting and profuse œa. After absorption it modifies the blood corpuscles pro- ly, changing the oxyhæmoglobin to methæmoglobin, and inducing sis with cardiac weakness; sometimes it causes delirium, coma cramps, and a peculiar stiffness of the extremities. It also egrates many of the red corpuscles, the colouring matter of , together with albumen, may escape in the urine; the colouring r exists in part as methæmoglobin and in part as oxyhæmo- . The urine may also contain the colouring matter in the form inular red or brownish red casts; some whole red cells may e present. The quantity of the urine is diminished: a condition, ore, quite similar to paroxysmal hæmoglobinuria is induced. ecchymoses appear sometimes in the skin, and general jaundice s sometimes. Owing to the gastro-intestinal catarrh the patient ains of pain and tenderness of the abdomen. The liver is found enlarged. At the post-mortem the blood appears of a chocolate , the liver and spleen are enlarged, and they, together with the w of the bones, contain much *débris* of the disintegrated red scles. Nephritis may also be present, and the kidney tubules nd full of brown casts.

chlorate of potash parts easily with oxygen, it was at one time sed that, by yielding up this element to the blood and tissues, it promote oxidation; but careful observations have conclusively l the erroneousness of this view, for the salt can be obtained un- d from the urine.

therapeutic influence, if any, on the organs of the body is un- n.

ias been recommended in facial neuralgia.

BICHROMATE OF POTASSIUM

RECOMMENDED in 1883 by Vulpian in the treatment of several forms of gastric affection, this drug has remained practically unknown till, recently, Fraser drew attention to its value in many forms of dyspepsia. In the *Lancet* of April 14th, 1894, he records its use in twenty-eight cases, a first group of eighteen cases of dyspepsia, unassociated with evidence of gastric ulcer, a second group of ten cases which at one time or another had shown distinctive evidence of ulceration. In these cases Fraser gave the drug alone, or at most in association with some purgative, when constipation necessitated such treatment.

The dosage is from $\frac{1}{12}$ to $\frac{1}{6}$ of a grain given either in pill (kaolin ointment forms a suitable basis) or in solution; practically the lower dose, $\frac{1}{12}$ or $\frac{1}{10}$ grain, is a sufficient one. The dose should be administered fasting: this is important; one hour before meals is a suitable time. If larger doses are employed, *e.g.* $\frac{1}{6}$ grain, some flavouring agent, syrup of orange or of tolu, is recommended.

The special indications for potassium bichromate are pain, nausea, vomiting, and epigastric tenderness. Fraser did not find that the treatment influenced any attendant anæmia. He was very successful with cases pointing to gastric ulceration.

He considers that the drug possesses direct analgesic powers, also that the strong antiputrefactive action which it exerts plays a part in its therapeutic value as an anti-dyspeptic.

It appears that in the use of potassium bichromate in stomach affections, Vulpian was preceded some thirty years by Dr. John J. Drysdale, of Liverpool, who amongst other statements says, "in round ulcer of the stomach it is one of the chief remedies in my experience, and also that of Hughes." (*Mat. Medica, Physiological and Applied*, 1884, p. 516.)

Dr. Bradbury, of Cambridge, has written more recently in confirmation of Fraser's results.

We have had some experience with the drug in out-patient practice, and have had very encouraging results. It has not answered in all cases, but in a sufficient number has been unmistakably successful. It has seemed, on the whole, that symptoms of ulceration have been the most amenable, but in other forms of dyspepsia it has often acted admirably, though, perhaps, less uniformly. More exact indications are still wanting, but as it stands potassium bichromate is a valuable addition to the means we possess of treating dyspepsia. We have followed Fraser's rules of administration and his dosage.

Locally applied, potassium bichromate is a powerful irritant and, in concentration, exerts a caustic action. It has been applied to warty growths and to syphilitic condylomata, also to fissures. For warts of the skin it may be used in saturated solution. Its application to res and to delicate structures, *e.g.* the mucous membranes, is ful.

se internal use of the drug seems to have been first hinted at by Cumin in 1827, who suggested that if cautiously administered it ht be found to possess, like arsenic, considerable tonic virtues. eira's *Materia Medica.*)

ALUM, DRIED ALUM, ACETATE OF ALUMINA

SE salts are employed almost exclusively as topical astringents.

hey act as astringents in virtue of their capacity to unite with men, and to coagulate it.

hey produce no effect on the unbroken skin, but when applied to s, they coagulate the albumen of the pus, or other secretion of the , and also the albumen of the tissues themselves, and thus the sore oated with an impermeable layer, and protected from the action of air. The salts of many other metals may, like alum, be used to a this protective coating. The albumen precipitated in the tissues mselves causes a condensation of the parts, in which is included a traction of the blood-vessels, whereby the blood supply is less- d. By constringing the blood-vessels, and by condensing the tissues mselves, the members of this group depress the vital activities of sore, and so check its secretions. For these purposes alum is lied either dry or in solution, to parts which are relaxed and over- reting, but there are other astringents from which we may get n better results.

wing to their power of condensing tissues and coagulating al- nen, these substances may be used to control the milder forms of ding, and in an emergency alum has the advantage of being almost ays at hand. In severe hæmorrhage other treatment will be of rse required, but to check bleeding from the gums, from piles, leech- s, or slight cuts, alum dusted on to the part affected or applied in ng solution is generally sufficient; before applying the astringent bleeding surface must first be wiped dry, so that the coagulation r take place within the substance of the tissues both in and around bleeding vessels.

lum solutions may be applied to freely-weeping eczematous surfaces heck the profuse discharge, and to bring the eruption into a con- on suited for other remedies, for, like other astringents, alum is erally insufficient in itself to heal eczema.

n the vulvitis of children, few remedies can be compared to alum l in the strength of sixty grains to a pint of water, and applied uently, every hour or oftener, by the help of a syringe, to the eting surface, after having first washed away the pus with warm er. The syringing finished, a piece of lint soaked in the lotion should be applied between the parts and kept there till the next syringing. Although generally successful, this treatment fails sometimes to check this troublesome complaint, even when it cannot be traced to any irritation, such as worms, constipation, or teething. In some cases the discharge, besides coming from the surface of the vulva, is poured out from the lining membrane of the vagina; in such case it is necessary to take care to pass the injection into the vagina. Want of attention to this fact explains the occasional failure of treatment and the apparent obstinacy of the case. The solution just recommended may sometimes prove too strong, increasing both the inflammation and the discharge; the strength must then, of course, be reduced.

Alum injections, one drachm to a pint, employed in the manner directed for the injection of the carbonates of potash or soda (see Potash group), are very useful in checking leucorrhœal discharges. The alum solution constringes the parts, but in so doing causes sometimes severe cramp-like pains in the belly.

In strong solutions, six grains to the ounce, alum has been recommended, though not much used, in prolapse of the rectum and uterus. A strong solution is sometimes used in pruritus vulvæ.

Similar solutions are useful in chronic otorrhœa, but here alum is far inferior to the glycerine of tannic acid.

A solution of alum, of the strength of eight grains to the ounce of water, forms an excellent wash in the simple ophthalmia of children, especially if the ophthalmia is purulent. The conjunctival sac must be well washed out with it every quarter of an hour, for success depends upon the frequency of the application. Simple water, as frequently applied, is a useful, though inferior, substitute, the water acting the part of a simple cleansing medium.

Few substances are as useful as alum in certain diseases of the mouth. Thus, simple ulcerative stomatitis—that form which, beginning at the edges of the gums, and never spreading far beyond, is often limited to, or most marked over, one-half of the jaw—gives way in a few days to dried alum applied with the finger many times a day. It is not merely astringent, but, owing to its attraction for water (which it has lost by being heated), is also slightly escharotic, and gently stimulating to the indolent tissues. Ulcers such as these produce ulceration by contact with the contiguous mucous membrane of the tongue or cheek. A slight drawback to the alum treatment is the acidity of alum, which will have some action on the teeth.

Aphthous ulcers, showing but little disposition to heal, or indeed, tending to spread, may be touched with dried alum a few times, daily, with the best effect. Usually, no such application is required, and chlorate of potash, with perhaps a purgative, is all that is necessary. Other forms of ulceration may be treated in the same way. Alum has been recommended to be applied to the throat, either dry or in solution, in simple or scarlatinal sore-throat, in tonsilitis, and even in heria; but since it is little used now in any of these cases, its ates exaggerated, perhaps, its good effects.

rgles of alum are more useful in chronic inflammations of the t, when the mucous membrane is relaxed and covered with a mucus or with pus; but although alum is highly useful, the rine of tannin is a surer and less disagreeable application.

n grains of alum to the ounce of water is used in the form of y for chronic coughs and hoarseness.

any cases of chronic ozœna yield speedily to a solution of alum, achm to the pint, applied by an irrigating tube. The mode of edure is as follows:—About a foot above the patient's head a jug aining the solution is placed, and in this jug one end of an elastic , which may be weighted. The solution is then sucked or manipu- d into the tube, and the free end inserted into one nostril, the f the nose being pressed on it to secure it in position. Thus we a syphon, and the fluid runs from the vessel through the tube, ne nostril, round the septum, and down the other nostril, washing the sinuosities of the nasal membrane most thoroughly. The d is bent a little forward over a basin, and the mouth kept open; roperly managed, none of the solution escapes by the mouth, or s down the throat.[1] Even when this irrigation fails to eradicate disease, it checks the discharge, and removes the offensive smell ending on the retention of decomposing matters. Some prefer tate of alumina as more efficient in correcting the fœtor than ple alum. If the fœtor persist, the application should be used ce a day, or oftener. If the fœtor is very great, a weak solution ermanganate of potash or of carbolic acid may be used. A wash a solution of glycerine of tannin in water is often useful; also a urated solution of boracic acid.

Alum behaves in the stomach as on the denuded skin, viz., it gulates the albumen, and constringes the mucous membrane [it ders digestion by each of these processes]. It will often check eding from the stomach, but it is inferior to other astringents. It netimes controls vomiting; thus, in six to ten-grain doses it will netimes check obstinate forms of vomiting, occurring in phthisical tients, and especially that form excited by coughing.

Dr. Meigs speaks very highly of alum emetics for children, and, in oup, he prefers alum to other emetics. He gives a drachm in honey syrup every ten or fifteen minutes, till the child vomits; a second dose is not generally required. Alum, he says, does not weake patient, and does not lose effect so soon as antimony or ipe anha, but my experience by no means confirms this statement. Meigs advocates strongly the employment of emetics in true c and thinks that many lives might be saved were they more comm used and oftener repeated. In severe cases he induces vom three or four times a day, or even oftener. This treatment mu begun early.

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[1] The "proper management" consists in a deep in- and expiration through e open mouth, whereby the soft palate is pressed upwards, so as to shut oft e nasal from the buccal cavity. A little practice soon accomplishes this at. The height of the jug may be lowered till the pressure is no more than st sufficient to carry the liquid through the nasal passages; if much pressre be used, it is certain to force the soft palate and cause the patient to alp some of the solution.

Alum checks secretion from the mucous membrane of the intes and constipates by rendering the contents of the canal more and more difficult of propulsion. Alum is sometimes used in acute and chronic diarrhœa; it has proved useful in the diarrh typhoid fever and of dysentery.

It is uncertain how far the members of this group pass dow intestinal canal before they are decomposed and rendered inert bably not far.[1]

Alum has been extolled by many high authorities in lead coli is said to remove the spasm and the pain, and at the same ti unload the bowels more speedily and certainly than other rem It should be given in large dose, as much as ten grains every The few trials I have made of this treatment have not been rew with success.

Dr. Justin finds that a grain and a half of sulphate of alumin and one grain of bismuth, with enough extract of gentian to fo pill, taken night and morning, is useful in chronic constipation.

The long-continued administration of these substances pro loss of appetite, constipation, and at last chronic catarrh of stomach and intestines. Large doses cause gastro-enteritis at with its usual symptoms.

Alum is an excellent remedy when the acute stage of whoop cough is over, and there is no fever or inflammation of the lung any irritation of the teeth. Its usefulness, in fact, is in uncom cated cases, and in these, few remedies give more satisfactory res It speedily reduces the violence and frequency of the paroxy often, indeed, lessening at once their recurrence by one-half, and curing straightway.

It checks the troublesome vomiting so often met with in whoop cough, and much improves the appetite—effects observed, somet even before the cough has undergone any diminution. Constip rarely happens.

It is possible that alum may control whooping-cough simply astringent action upon the throat, and in support of this conje we find that other astringent substances, such as tannin, etc., are likewise useful (*see* Tannin), when applied to the throat alone. Alum itself acts best when mixed with some tenacious fluid, such as gum, glycerine, or honey, by which the solution is made to cling about the fauces.

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[1] Alkalies and carbonates are incompatible with alum solutions, a the intestinal secretions alkali predominates; but does the precipitate minium hydrate or carbonate cease to act? Aluminium hydrate ha employed as an intestinal astringent (*cf.* Pereira).

In whooping-cough alum should be given in doses varying from two to six grains every three hours, or it may be given hourly in reduced doses. In this affection alum is generally beneficial to the paroxysmal cough which may continue for a long time after the characteristic whoop has disappeared; it is also useful in other coughs having a like spasmodic character.

It has been said that ten grains of powdered alum, placed dry upon the tongue, will sometimes arrest a paroxysm of asthma.

It is unknown how much of these substances is absorbed by the intestines, and conveyed into the blood, probably not a large quantity. The chief part escapes by the fæces, which the alum is said to make firmer and odourless.

It is doubtful if alum has much effect as a remote astringent in checking bleeding from the lungs, uterus, kidneys, etc., and in checking profuse sweating and discharges.

PREPARATIONS OF IRON

Iron is a constant and necessary constituent of the body, and must be regarded as an important food.

Topically, none of the preparations of this metal when applied in the unbroken skin produce any change in it; but when applied to raw surfaces, sores, and mucous membranes, the more soluble salts combine with the albumen of the fluids and tissues, condensing the parts, and constringing the blood-vessels. Besides this astringent action, they at the same time act as stimulants or irritants, according to the strength of the application or the condition of the sore.

The organic salts are less astringent and stimulating than the inorganic; while of the inorganic, the ferric salts possess these properties in a greater degree than the ferrous salts.

The soluble preparations of iron have a metallic, astringent taste.

Several compounds of iron may be employed as astringents and stimulants; but, when a stimulant pure and simple is required, other metallic preparations are to be preferred. The sulphate, and in particular the ferric chloride, solid or in solution, are employed to check hæmorrhage. The chloride is a powerful styptic, and readily controls the bleeding from small vessels, but it has the disadvantage of irritating the surface of wounds, and of preventing union by first intention.

None the less the perchloride and sulphate of iron are valuable astringents both to the surgeon and the physician; the perchlo as stated, is the more powerful.

Lint and wool impregnated with the perchloride can be obtain the dry state for styptic purposes. (See *Extra Pharmacopœia.*) In application of this, as of all other astringents, it is important the surface to be acted upon should be dried as carefully as pos before applying the styptic; the latter should therefore be app instantly on the withdrawal of the drying pledget (*cf.* Alum).

A solution of an astringent preparation of iron, *e.g.* a drachm the *solution of the subsulphate* in eight ounces of water, is to be rec mended as a spray in bleeding from the nose or lungs [insufflation the powdered sulphate, even, has been successfully employed]; tho one might have expected that this treatment would excite co and so favour bleeding, yet this is not the case. A similar spray useful also in chronic ozœna. The subsulphate is an oxypersulph *i.e.* a basic persulphate; it must not be confused with ferrous phate. The subsulphate is held to be one of the most astring preparations of iron and at the same time one of the least irritati The solution here spoken of is a U.S. preparation, known otherw as Monsel's solution. Monsel's solution is also used internally a styptic in doses of 3-6 or 10 drops in a tablespoonful of water.

To Dr. Barnes we are indebted for having suggested the inject of the perchloride of iron into the uterus in grave cases of floodi after delivery. In such cases, obstetricians are well-nigh agreed t this procedure is effective and life-saving. Dr. Barnes recomme that four ounces of the liquor ferri perchloridi mixed with twelve water, should be slowly injected into the uterus with a Higgins syringe furnished with a long uterine tube, care being taken to av the introduction of air and to allow a free outlet for the fluid.

In chronic uterine catarrh, with clear white-of-egg-looking charge issuing from a patulous uterus, Dr. Lloyd Roberts recomme the swabbing of the interior of the organ with a solution comp of one part of perchloride of iron to four of water, or the injectio a few drops of the solution.

The tincture of the perchloride of iron, in the proportion of a drachm to half a pint of water, with a drachm of laudanum, m a capital injection for gonorrhœa or gleet, often speedily chec the discharge, and easing the pain on micturition. The follo prescription for an injection is also useful:—Sulphate of iron tw grains, tincture of opium half an ounce, water eight ounces three times a day. These injections are most efficient when directly after the urethra has been washed out by micturition. or three drachms of the solution should be used at a time an tained for a minute or two.

In the treatment of the small thread-worms infesting the rec the tincture of the sesquichloride, in the strength of a drach

a pint of water, is an efficient injection; it coagulates the
men and destroys the thread-worms.

ncture of iron, painted over an erysipelatous surface, is a useful
ication. This treatment is commended in the erysipelas follow-
vaccination.

on salts are never employed as topical agents in diseases of the
th, because they are liable to discolour the teeth and stain the
gue black, especially when the breath contains sulphuretted hydro-
gas, arising from carious teeth, etc.; they are therefore best taken
ugh a quill, glass tube, or reed. They are conveniently given in
form of pill for the above reasons.

he effects of these salts on the stomach differ according to their
n and preparation. Some are astringent, stimulating, and in
ge doses irritating to the mucous membrane, such are the
nitrate, the perchloride, the iodide, and the sulphate; the remain-
preparations with respect to this membrane are relatively inert.
ordingly, when the stomach is irritable, bland preparations of iron
st be chosen. It is often stated that chlorotic or anæmic patients
h weak stomachs should also be treated with bland, unirritating
parations of iron, and in some instances, no doubt, the astringent
parations are unsuited, but in most cases they produce far better
ults than the bland forms of iron. A pale, flabby, broad, and
th-indented tongue, indicates almost always the need of large
es of the astringent preparations of iron. Thirty drops of the
cture, or three or four grains of the sulphate, may be given three
nes a day. Weak anæmic girls, suffering from pain and vomiting
ter food, with perhaps tenderness at the epigastrium, are often
ectively treated by large quantities of the tincture of the per-
loride.[1]

The soluble preparations of iron combine with albumen in the
mach, forming insoluble albuminates, these, however, are soluble
dilute acids and in the gastric juice; the insoluble preparations
dissolved to a variable extent in the acids of the gastric juice,
then react as just stated. The reduced iron, ferrum redac-
m, is fairly soluble in the gastric juice, with evolution of some
drogen gas, or, if the preparation is impure and contains a sulphide,
sulphuretted hydrogen, either gas causing eructations, and the
phuretted hydrogen a very disagreeable taste. The peroxide, after
ong heating, dissolves in the stomach with great difficulty; pre-
ence should therefore be given to the more slightly heated forms.
e carbonate and the magnetic oxide are more easily dissolved than
sesquioxide.

The astringent preparations, such as the perchloride, pernitrate, acetate,[1] and sulphate, are employed to check hæmorrhage from the stomach; they should be administered in small doses, in iced water, hourly. In proportion to their astringency do these preparations confine the bowels.

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[1] The fact is that these dyspeptic symptoms of anæmia are indications,
bably, of atony rather than irritability.

Since, after quitting the stomach, the soluble iron salts are soon changed into an insoluble and inert sulphide, or are otherwise precipitated by the alkaline contents of the intestines, their astringency must expend itself on the upper part of the small intestine.

The sulphate, acetate, perchloride, pernitrate, in common with other astringent metallic preparations, may be given in diarrhœa. The pernitrate, much praised in the chronic forms of diarrhœa, is probably an efficient preparation.

Owing to the astringency of iron salts, it is well to combine each dose with some laxative, such as a quarter of a grain of aloes, a few grains to half a drachm of the sulphate of magnesia, or soda. Some authorities consider that the combination of iron with a laxative promotes markedly the absorption of the iron. Iron salts, however, do not always constipate, and, indeed, large doses of the astringent preparations, such as the sulphate, will often relieve constipation.

In their course along the intestines, iron salts, as we have said, are changed into the sulphide of the metal, thus giving to the fæces a black and characteristic appearance. A very small quantity of an iron salt is sufficient to stain the motions deeply, and to keep them darkened for several days after its discontinuance. Iron salts have no direct influence on the pancreatic or biliary secretions.

It is an interesting and important question for consideration, how much iron is absorbed into the blood. Of the insoluble forms, probably but little, since the quantity of acid in the stomach is not adequate to dissolve much; but of the soluble preparations, also, it is hard to say how much gets into the blood. The increase of the iron in the urine being very slight, after the administration of a soluble iron salt, it has been concluded that very little passes into the blood; moreover, the fact that almost all the iron taken by the mouth may be re-obtained in the fæces, seems to strengthen this view: an extended knowledge, however, concerning the elimination of metals from the body shows this conclusion to be fallacious. Most metals probably, iron certainly, are eliminated from the system through the intestines, and make their exit with the fæces, for, when iron salts are injected directly into the blood, almost all the metal is ultimately recoverable in the fæces. That much more is absorbed than is appropriated by the blood corpuscles is shown by the coloration which iron produces in all the albuminous secretions of the body, the fluids bathing the various cavities becoming of a reddish-brown colour. Still the quantity absorbed from the alimentary tract is probably not very large, for when an iron salt is injected into the blood, much of it passes out by the urine, whilst, as above stated, very little of the iron taken by the mouth appears in the urine.

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[1] The acetate so called is really the peracetate.

Oxide of iron possesses an ozonizing power: "Thus, a spot of iron mould, *i.e.* iron oxide, on linen, will in time destroy the fabric. From a similar cause a fleck of rust on a bright surface of steel will steadily enlarge and deepen." (Horatio Wood.) Hence it has been argued that the iron of the blood corpuscles will act in the same way, converting oxygen into ozone, and thus promoting oxidation, ozone being the active form of oxygen within the system.

In the treatment of anæmia many physicians advocate the use of large doses of iron salts; others, instancing the beneficial effects of ferruginous waters, strenuously maintain that all the good effects are obtainable from very small doses. In many instances, no doubt, anæmia is curable by the employment of small quantities of iron, but it is likewise certain that large quantities, when they can be borne, act far more promptly. Half-drachm doses of the tincture, or six to eight grains of the sulphate, may be given two or three times daily. The following pill, originally employed by Blaud, and strongly recommended by Niemeyer, is no doubt very efficacious, but the iron without the carbonate of potassium appears to answer as well:—Sulphate of iron, carbonate of potash, of each half an ounce; tragacanth, as much as is required to make ninety-six pills; three to be taken three times a day, an additional pill being added daily. Bland's pill is now official as the pilula ferri; the above stated formula is slightly modified.

A convenient pill is made with five grains of the dried sulphate of iron, the equivalent of about nine grains of the ordinary sulphate, and a drop of syrup. This sets into a firm pill which is easily dissolved in the stomach. A small quantity of extract of belladonna may be added to prevent constipation, though when given alone this pill seldom constipates. Large doses of iron, while rarely upsetting the stomach, or producing headache, often cure anæmia with astonishing rapidity. This pill is especially useful in chlorosis, but when it cannot be borne I obtain excellent results by giving five grains of the reduced iron three times a day.

The experiments of Drs. Cutler and Bradford, conducted after Malassez's method of counting the blood corpuscles, show that in *health* iron does not increase the number of blood corpuscles, though it does in anæmia.

Iron salts are used largely in anæmia; they are especially useful in chlorosis. Cases of anæmia, exclusive of those forms which are due to loss of blood or to exhausting organic diseases, fall into one of two classes, though transitional or mixed cases often occur. In chlorosis, the number of corpuscles is but little reduced, but their hæmoglobin is very deficient in quantity or quality and hence in colouring power. In pernicious anæmia, on the other hand, the number of corpuscles is greatly reduced, but the colouring matter in each is normal in amount, sometimes even is in excess. Iron is chiefly beneficial in chlorosis, *i.e.* where the hæmoglobin is deficient without much diminution in the number of corpuscles; it is much less serviceable, indeed is very often useless, in pernicious anæmia, in which serious condition, on the other hand, arsenic is very useful.

In chlorosis the *production of corpuscles is but little diminished*, but they contain too little colouring matter. There is also excess of the larger and especially of the smaller red corpuscles, the smaller being newly formed and ill-developed, and easily acted on by re-agents. There is indeed in chlorosis "imperfect evolution of blood." (Willcocks, Moriez.) Iron improves the condition of the blood discs, increases their colour and lessens the amount of small-sized discs.

In pernicious anæmia the *production of red corpuscles is reduced*, and in such cases iron has very little influence, arsenic being a much more potent remedy; it is argued hence that iron exerts little or no influence on the formation of red corpuscles.

It is true that in chlorosis the number of red discs may be somewhat reduced, and that iron salts will augment their number; but it is held that this is due not so much to an increase in the production of discs, as to the fact that iron improves the vitality of the red corpuscles by increasing their hæmoglobin, and so by prolonging the life of the red discs permits of an increase in their number. The increase is thus due to a lessened rate of destruction.[1]

In many cases of anæmia, the combination of iron with arsenic is very useful, and we may repeat again that the addition of some aperient also is often desirable.

Iron salts are useful likewise in the anæmia of hæmorrhage, and, though to a much less extent, in the anæmia dependent on organic disease.

The long-continued use of iron is highly beneficial in scrofula and in rickets.

Iron salts are commonly administered in amenorrhœa. This complaint or symptom is usually conjoined with much anæmia; the iron acts here by remedying the anæmia, and thus assisting to restore the uterine functions.

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[1] The whole question of the absorbability of iron when administered in the form of inorganic salts is a very vexed one. Bunge regards it as most probable, though not conclusively demonstrated, that such preparations are *not absorbed*. According to him the only iron which is available for absorption and for metabolism is the iron of the food, which is all in the form of *organic compounds*. Bunge admits the value of the inorganic salts in chlorosis, in larg doses, but their value he explains as due to the protection which the inorganic salts offer to the organic iron of the food. The former, viz., prevent th products of intestinal decomposition, especially the sulphides, from attackin the iron of the food, themselves fixing the sulphur, etc. It has been alread pointed out that in chlorosis there is often marked alimentary disturbance.

To treat satisfactorily a case of anæmia, it must be remembered that anæmia, in most cases, is dependent, not on deficiency in the supply of iron in the food, but on its scanty assimilation; hence the use of iron must be conjoined with well-regulated hygienic conditions, otherwise it will do comparatively little good.

In anæmia iron salts possess other important properties besides their influence over the growth of the corpuscles, thus they will act bracingly on the relaxed mucous membrane of the digestive canal, and probably in this way tend to restore its digestive and assimilative functions; moreover, it is highly probable that after its entrance into the blood the iron will exert an influence beyond that of merely increasing the quantity of red corpuscles, or of hæmoglobin. On this hypothesis iron salts will be useful, not only as a food to promote the welfare of the blood discs, and so improve the general nutrition, but likewise on account of their direct beneficial influence on the tissues. Iron would thus be regarded both as a food and as an important curative agent. When it is desired to benefit in a tonic way the mucous membrane of the digestive canal and the tissues, large quantities of the soluble astringent preparations should be administered.

The experience of physicians of the last generation accords with these views, so also does that of many highly practical men of the present day; but, upon the introduction of the bland and almost tasteless preparations of iron, these were assumed to be in every way superior to the astringent forms. Their comparative tastelessness is certainly in their favour, but the view that the astringent preparations must disorder digestion is mainly speculative; this theoretical, and as I believe unfounded, opinion prevails, however. I hold, indeed, that in a certain class of anæmic patients the astringent preparations, even in large doses, are undoubtedly to be preferred, a large share of the efficacy being due to this same astringent action upon the mucous membrane of the stomach and intestines, and upon the organs which are immediately related to them. Further, it has been experimentally shown that sulphate of iron does not check the solvent action of the gastric juice, experience justifying the conclusion rather that in weak anæmic patients it does not lessen, but increases the formation of this secretion.

If the digestive mucous membrane is already in an irritable state, then, as has been previously pointed out, the astringent iron preparations, in full doses, may do harm.

In the administration of iron, individual peculiarities must be taken into account; thus, some persons cannot take iron in any form, not even a single dose of a weak ferruginous water, the iron perhaps upsetting the digestive organs, or inducing fulness and pain in the head.

Where iron agrees well, it is sometimes advisable to humour the stomach by occasionally changing the preparation of iron.[1]

In cases of neuralgia with anæmia, where no organic disease can be discovered, salts of iron are especially to be recommended, although it is true their action is uncertain. The huge doses of these salts sometimes given, especially of the sesquioxide, are probably injurious, and are less serviceable than the smaller ones.

Large doses of the perchloride of iron are of great benefit in diphtheria. It is better to use the solution, *i.e.* the liquor, rather than the tincture, and to give the medicine very frequently—every hour, or even oftener. It is uncertain whether the effects upon the throat depend on the topical action of the medicine, or upon its action after its entrance into the blood. The solution may also be painted on the throat at frequent intervals, great pains being taken to apply it very gently, lest by increasing the inflammation it do more harm than good; this treatment appears to arrest the spread of the disease, and is said to maintain the patient's strength. The solution may be applied with the atomizer, so as to penetrate into the trachea and bronchial tubes.

Large doses of the perchloride, hourly, have been found of great use in erysipelas, though with some observers the treatment by large doses has altogether failed; the failure has been due, perhaps, to the intervals between the doses having been much longer than those recommended. The *frequent* repetition of the medicine, indeed, is one of the most necessary conditions of success.

In the so-called hysteria of middle-aged women, occurring especially at the cessation of menstruation, complaint is often made of distressing fluttering of the heart, fulness of the head, with heat and weight over the vertex, frequent flushings of the face, and "hot and cold perspirations." This combination of symptoms is generally removed by considerable doses of the sesquichloride of iron, given three times a day; but if the symptoms are limited to the head and face, other remedies are more successful, *e.g.* nux vomica, opium, belladonna, bromide of potassium, nitrite of amyl.

Salts of iron sometimes excite irritation of the bladder, with frequent desire to pass water, in which may be contained a considerable quantity of mucus. In children they may cause nocturnal incontinence of urine, yet iron salts not infrequently cure this troublesome complaint, even when not dependent on worms in the rectum, or on other irritation.

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[1] Schmiedeberg has recently brought forward an organic preparation of iron, in which the metal is combined with a proteid; of this Schmiedeberg makes claim that it is both absorbed and assimilated; in fact, he claims that it will take the place of the iron of the food (Bunge's hæmatogen). This new preparation is named Ferratin; it is an insoluble powder, its dosage 8 to 15 grains. It certainly will give excellent results, but whether it possesses any real superiority is more doubtful.

ent preparations of iron contract somewhat the blood- the body generally, and are employed to arrest hæmorrhages lungs and kidneys.

f iron, given internally, appear to lessen profuse secretions cur in chronic bronchitis and in leucorrhœa. Dr. Graves compound iron mixture, Griffiths', in doses of one or two hms, to check excessive bronchial secretion.

lide of iron may be given where both iron and iodine are for instance, in syphilis complicated with anæmia. It is of much interest whether it is better to administer these ts separately or combined in the iodide of iron, and in the e whether the constituents continue in combination in their ough the system, or whether the salt is decomposed. Viewing tion simply from a chemical point of view, it would seem dide of sodium and albuminate of iron must be formed in ch or blood, though some observations, made I believe rd, throw much doubt on this conclusion; for it was found lide of potassium and a salt of iron were injected into the iron appeared in the saliva, whereas when an iodide of iron ted, then both iodide and iron were found in this secretion.

manner when we wish for the combined effects of iron and pon the system, it is a question whether we should not e the arsenious compound and the iron salt separately than d salt such as the arseniate. This holds here for an addi- son, viz., that if we use the arseniate, its dosage, regulated tency of the arsenic, does not allow of a sufficient iron

n of the effete red corpuscles escapes probably with the when iron salts are swallowed this fluid is found to contain of the metal. This, therefore, is one way by which iron may ted from the body.

rup of the phosphate of iron is a good preparation, if there ndications for the employment of phosphoric acid. (*See* e of Lime.) Iron may also be given with advantage as a phite, as *e.g.* in Fellows' syrup.

oonful of lemon-juice covers the taste of iron preparations.

lso, covers the styptic taste of iron.

lts should be administered soon after a meal, if we wish to eir hæmatinic effects.

SALTS OF MANGANESE

The sulphate of manganese in large doses, acting on the mucous membrane of the stomach, excites vomiting and purging. It is said to increase the flow of bile, but Rutherford says it is a powerful irritant to the mucous membrane, but not a cholagogue. Manganese is generally, and according to some investigators always, found in the blood corpuscles, and it has come to be regarded as a normal constituent of the red discs; this has led to the administration of its salts in anæmia, though, in the hands of trustworthy observers, without any benefit.

Manganese salts, long persisted in, produce, according to Bartholow, wasting, feebleness, staggering and paraplegia. They are said to cause acute fatty degeneration of the liver.

The permanganate is a powerful oxidizer, yielding ozone; it is widely used as a disinfectant and deodorizer.

Leared gave ten to fifteen grain doses of the black oxide in gastrodynia and pyrosis.

Bartholow recommends the permanganate in dyspepsia with flatulence, also to assist the conversion of uric acid into urea. It has been given internally in scarlet fever, diphtheria, erysipelas, puerperal fever, and pyæmia; the permanganate, however, can only act as such upon the mucous membranes with which it comes into contact, for it must be decomposed rapidly in the stomach before it undergoes absorption.

Kobert finds that manganese salts are more poisonous to frogs than salts of cobalt, iron, nickel, or tin. In the frog small doses suspend voluntary motion, larger doses slow the reflexes, and render the heart weak, still larger doses arrest the heart in systole, but the excitability of the nerves and muscles for direct stimulation lasts for hours.[1]

In cases of deficient, delayed, or arrested menstruation I find permanganate of potash very efficacious. Other salts of manganese would in all probability act equally well, but I have not yet had time to test their action. The permanganate itself, as already stated, cannot pass into the blood undecomposed.

In the amenorrhœa of young women, the permanganate will restore struation after the lapse of two years or longer; sometimes it restore the discharge within a few days, or, the immediately eeding period being missed, the one next appearing in due se, or it may take six weeks or even two months before the ƺ succeeds.

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[1] According to the investigations of Cahn on rabbits, the salts of manganese are not capable of absorption *from* the alimentary tract. Injected into the blood they are excreted in the urine and by the alimentary tract, being found in the contents of both stomach and intestines. (Bunge.)

Manganese is sometimes combined with iron, thus the phosphate of manganese may be administered in dose of one to five grains along with the phosphate of iron. A double peptonate of iron and manganese in solution is also administered. (See *Extra Pharmacopœia.*) The dosage of manganese salts in general will be from one up to five, ten or more grains, beginning with the lower doses.

find that this salt is useful also in the very common case of scanty, perhaps delayed, menstrual flux, the interval varying from six ks to two months. The permanganate in a case such as this brings the period at its proper time, together with an increase in the r.

t is useful, also, when a chill prevents or delays the menstrual w; thus, in the case of a woman who had prevented menstruation taking a cold bath on the day when it should have appeared, usual symptoms arising from arrest of the catamenia made ir appearance: three doses of the permanganate having now tored the flux, she discontinued the drug, whereupon the discharge sed. She now again returned to the medicine, and after another e doses the flow reappeared and progressed naturally.

usually give the salt daily until the catamenia appear and plete their course, then I discontinue it; again I recommence it r days before the access of the next period, and continue it till the w ceases.

Dr. Fordyce Barker found the permanganate useful in girls who, leaving the country and coming to town, suffer from arrested nstruation; also in the amenorrhœa induced by sea sickness; o in the case of women, between thirty and forty, generally rried, who whilst rapidly increasing in weight suffer from a ninished menstruation.

Dr. Murrell and I in our investigations did not find that the manganate produced abortion, but some cases of abortion appar-ly due to the drug have been published.

find the salt successful in both cases of anæmia, and in plethoric ients; it certainly does not act by improving the quality of the od.

At first I gave of the solution of the permanganate from ʒss. to thrice daily, but its disagreeable taste often provoked nausea and niting, especially after continuing the drug for some time. I now e one, two, or more grains in pill-form thrice daily, *after meals.* . Martindale makes the pills according to the following formula:— manganate of potash gr. 1, kaolin and petroleum cerate, in equal ts q. s.

SUBNITRATE OF BISMUTH, CARBONATE OF BISMUTH

THESE powders are both basic salts; the carbonate should be named subcarbonate; they are commonly used as harmless cosmetics; as dusting powders they are useful in intertrigo, and sometimes in eczema; but in eczema other remedies are to be preferred.

Applied to the broken or unbroken skin, these substances, being insoluble in any fluid they may there meet with, are not absorbed.[1]

Trousseau employed equal parts of bismuth and Venetian calc in chronic non-syphilitic ozœna, ordering the patient, after clearing the nasal passages by blowing the nose strongly, to sniff up some of the powder. He, however, prefers mercurial powders. (See Mercury.)

Being insoluble, the salts of bismuth are tasteless, but they sometimes occasion a disagreeable sensation of roughness; they sometimes blacken the tongue. The rough sensation may be obviated in great degree by administering the drug in milk.

Little is known at present of the changes which these medicines undergo, and of their behaviour in the stomach and intestines. Whether they are to some extent dissolved or not, or whether their efficacy depends on physical or chemical properties, these are questions yet unsolved.

In many diseases of the stomach, these preparations, especially the subnitrate, are very valuable, easing the pain incident to many affections of this organ, whether depending on organic or upon so-called functional disease. In cancer, chronic ulcer, and chronic inflammation of the stomach, bismuth is often serviceable; it is especially useful in the chronic gastritis of drunkards, in which it subdues the pain, checks the vomiting, and enables the stomach to tolerate food. It is useful also in gastrodynia and cramp of the stomach. Many forms of vomiting in children, and notably that kind depending on acute or chronic catarrh of the stomach, yield speedily to bismuth. The various forms of pyrosis, whether acid, alkaline or neutral, are very amenable to this drug, although our limited knowledge concerning the causes of this form of indigestion fails to enable us to lay down precise rules respecting the particular form of it which is most benefited by bismuth.

Dr. Graves treated acidity of the stomach with subnitrate of bismuth, and experience confirms his practice; he generally mixed it with opium or morphia, and sometimes with magnesia. Flatulent dyspepsia, in some of its forms, yields more or less to bismuth; for trouble it is well sometimes to mix it with an equal quantity of table charcoal.

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[1] More recent experience of the local use of bismuth as an antiseptic in surgery has shown that some absorption even of the more insoluble salts does take place, and to the extent even of producing toxic effects marked by alimentary tract irritation (stomatitis, intestinal catarrh, with diarrhœa), and in some cases by the development of nephritis. (*See* Wood.)

ese remedies often succeed in certain forms of chronic diarrhœa, especially when other drugs fail. In the exhausting purging of isis, it is necessary to give as much as half a drachm to a drachm he subnitrate several times a day; this large quantity, taken in , does not disturb the stomach. It thus often subdues an in- table diarrhœa, effecting, occasionally, so great an improvement he general health, that patients whose speedy death seemed in- ble rally and recover.

the various forms of diarrhœa peculiar to young children, uth, in large doses, is freely used on the Continent. A dose of ty to sixty grains hourly is recommended, milk being at the same withheld. Much smaller doses, however, given in milk, are sufficient: thus, a grain hourly is very efficacious. The addition sixth of a grain of grey powder often enhances the efficacy.

Bismuth preparations are not employed to act on the remote organs he body.

It is interesting to note that large doses of the soluble preparations as the citrate of bismuth and ammonia act much like antimony senic, causing gastro-enteritis and fatty degeneration of the liver. unton.) In these soluble preparations bismuth thus shows a phar- cological likeness to its chemical congeners, arsenic and antimony. asionally we meet with patients who complain of feeling sick after ing the usual hospital bismuth mixture; it is not improbable that of these cases may be due to an unusual susceptibility to muth resulting from the solution and absorption of small quantities the subnitrate or subcarbonate. For upon the whole the evidence in favour of a slow absorption by the alimentary tract of these tively insoluble preparations. It has been shown by Kocher at these same insoluble salts exert considerable antiseptic powers. e H. C. Wood's *Therapeutics*.)

A bismuth injection, consisting of bismuth subnitrate or subcarbon- half an ounce, glycerine half an ounce, water three ounces, is ry useful in gonorrhœa, especially in its chronic stage; it some- es proves serviceable in gleet. In the early stages of gonorrhœa C. Wood recommends an injection containing twenty grains to ounce; it should be used every two hours.

The chief part, if not all, of the bismuth swallowed is evacuated in fæces, and stains the motions a dark slate colour; the quantity tering the blood is probably extremely small.

Hans Meyer finds that bismuth salts are eliminated by the mucous mbrane of the intestine, especially by that of the large intestine, after the subcutaneous or intravenous injection of a bismuth salt mucous membrane becomes blackened, and bismuth can be detected it. Sometimes the mucous membrane of the intestine has been found ulcerated; this may result, Meyer suggests, from the blocking of arteries by sulphide of bismuth.

The insoluble salts of bismuth are frequently prescribed in sus sion with mucilage, but the latter may with advantage be omitt the patient will take the trouble to shake the bottle well and pou the dose quickly.

The subnitrate, if prescribed with an alkaline carbonate, give carbonic acid, and may burst the bottle; the subcarbonate of bis should be employed under these conditions.

Of late numerous salts of bismuth have been introduced both medicine and surgery. Thus we find compounds with benzoic salicylic acid, carbolic acid, and gallic acid. These combinations in view, for the most part, the strengthening of the local anti powers of bismuth salts. For these same antiseptic powers the employed in surgery and in medicine, in the latter in alime conditions, gastric fermentations, diarrhœa, etc. The salicyl bismuth in ten or fifteen grain dose gives good results.

The gallic acid compound is a subgallate, it is employed i affections, and is known as Dermatol. It is used either as such dusting powder, or mixed with starch or French chalk; also ten or twenty per cent. ointment with vaseline. Internally been given in doses of ten, twenty or thirty grains, thrice da intestinal conditions. The doses of the other insoluble prepa average from two to ten, up to twenty grains. (*See* Helbing's *Materia Medica*, also "*The Extra Pharmacopœia.*")

LEAD SALTS

LEAD salts added to albuminous fluids form a precipitate com albuminate of lead. Like other of the heavy metals, the solul of this element, when applied to the abraded skin, or to sor mucous membranes, coat them with an impermeable air-proo ing of albuminate; if, however, a protecting covering is all required, other metallic salts are generally employed by pr Any excess of lead solution, after combining with the alb parts of the secretions, will unite with the tissues themselves manner lead salts condense the structures, and constringe tl vessels. The soluble lead salts are used as lotions to unhea over-secreting sores, and to discharging eczematous eruptions; forms of eczema indeed they are very useful. Thus, if there inflammation, and the surface is raw and weeps copiously, a le will allay inflammation, check the discharge, and quell the burning, and tingling, which so often accompany eczema. three drachms of the liquor plumbi subacetatis in ten o water are generally sufficient, but a stronger lotion, consi

s of the liquor plumbi, two ounces glycerine, and four
water, proves sometimes more successful.[1] When the
on is great, and the weeping abundant, the rash must be
antly covered with rags soaked in the lotion. In some
useful to apply a poultice at night, and the lotion during
The stronger lotion is especially useful in diffuse eczema,
eping, but with excessive itching and tingling; the dis-
should be sponged with the lotion several times a day. A
ine bath, or a sulphur bath, greatly assists the action of the
fluid which oozes so abundantly in eczema being strongly
e property of these lotions to check the discharge may be
art, to their weak alkaline reaction. (*Vide* the chapter on
Influence of Acids and Alkalies on the Secretions.) The
tion very effectually allays the itching of pityriasis. Lead
sionally ease the itching of urticaria.

tion is often of great service in pruritus pudendi, especially
mucous membrane is red and excoriated. A weak lotion
fails where a strong one succeeds. It may be necessary to
parts of the liquor plumbi and glycerine, an application
excite a little, though very temporary, smarting. When
s pudendi depends on ascarides, hæmorrhoids, or a tumour
hral passage, it is obvious that these applications are use-
ative agents.

of one part of the liquor plumbi, to one or two parts of
pplied warm, after the crusts have been entirely removed,
the milder forms of lupus.

ead salts have many properties in common with those of
eavy metals; they are distinguished by their *non-irritant*,
aracter, whence they are so extensively used as astringent
g applications.

ble lead preparations may be used to check bleeding from
ls, but other astringents are more effective.

of the subacetate and acetate are employed as injections
in chronic otorrhœa and in the vulvitis of children. They
production of pus, and ease pain, by virtue of their
and their soothing qualities. They are of most use when
cute stage has just subsided, the tissues still remaining
d painful; in the later stages stronger astringents are

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weaker solution here recommended, viz., two or three drachms to
, is exactly twice or thrice the strength of the Liquor Plumbi
ilutus of the B.P. The U.S. weaker and official preparation has the
s that of the B.P., viz., Liquor Plumbi Subacetatis dilutus, but
an twice as strong. For most uses our weaker solution is too
en the Liquor Plumbi is spoken of without further qualification,
solution is meant.

Lead injections are sometimes employed in gonorrhœa, gleet, and leucorrhœa.

In ulceration and sloughing of the cornea, lead washes must be avoided, lest a white precipitate be deposited in the structures of the ulcer, leaving a permanent opacity.

Bland, unirritating plasters, made of lead, are in common use.

These plasters, and lead applications generally, are sometimes objectionable, owing to the black discoloration which they produce, due to the formation of the black sulphide with the sulphuretted hydrogen gas evolved by the decomposition of the discharges.

A stout plaster often relieves pain in the loins, due to weakness. Burgundy pitch on leather is generally used for this purpose, but it is very liable to produce a crop of itching papules, which may spread over the greater part of the body, while lead plaster, though somewhat less adhesive, is comparatively free from this objection. Plasters sometimes relieve the back pains due to uterine disease or to piles.

For sweating feet, Hebra employs an ointment composed of equal parts of lead plaster and linseed oil, spread on linen, and wrapped round the feet, renewing the application every third day for nine days.

The same ointment applied on soft linen twice daily is sometimes invaluable in the subacute stage of eczema. Dr. Matthews kindly draws my attention to the fact that this ointment must be used fresh, since it is prone to become rancid in a few days.

Mr. Alfred Aspland recommends the local application of white paint for burns. He claims that it relieves the pain in some two minutes.

The insoluble lead salts are tasteless, the soluble have a sweetish, acid and astringent taste.

The soluble preparations are astringent to the mucous membrane of the mouth, and combine with the albuminous substances they meet with there.

That portion of the soluble compounds of lead which escapes combination with albumen in the mouth is converted into an albuminate in the stomach.

The soluble lead preparations are sometimes used in hæmatemesis as astringents; they have been recommended to check pyrosis, though the mode of action is not quite clear.

Albuminate of lead in the intestines is probably decomposed speedily into a sulphide of lead, an insoluble and inert compound. The soluble salts act powerfully as astringents to the intestines, and cause constipation; they are used to control many forms of diarrhœa, dependent even on disease of the lower part of the small bowel, or of the large intestine.

These effects of lead on parts of the intestines distant from the stomach and duodenum, can be manifested only through the nervous

through the blood; as to the former or reflex mode, we
intimate sympathy which exists between the different parts
nal, and so can understand how an astringent impression
duodenum might be reflected upon the lower and distant
ie bowel.

ner diarrhœa, a few grains of the acetate with a small dose
is a sure and speedy remedy.

tate has been recommended in cholera, especially in its early
n the purging from dysentery and typhoid fever, and from
disease of the intestines, few remedies are so useful. The
ould then be combined with opium.

ases the efficacy of a starch injection in checking various
diarrhœa, and it may be used for a similar purpose as a
y.

doses, the acetate acts as a weak irritant poison, but the
it produces differ from those of other irritants, chiefly by
pation produced instead of the usual purging.

no means common to meet with a case of acute poisoning
lts, and even the most soluble rarely cause death.

poisoning by the acetate induces the following symptoms:
ing sensation in the throat, thirst, vomiting, colic (the pain
is generally relieved by firm pressure), tenderness of the
obstinate constipation, dark slate-coloured motions from the
f plumbic sulphide, great prostration of strength, cramps
remities, cold sweats, giddiness, numbness and even paraly-
lower limbs (sometimes coma is present): the urine is high-
nd scanty. In one case it is reported, that in less than five
extensor muscles of the extremities became paralyzed, and
s rigidly contracted. The subacetate is a poison even
erful than the acetate. The carbonate has no irritant
account of its insolubility.

atment of acute poisoning is to promote vomiting by luke-
nks; to give sulphate of soda, or sulphate of magnesia, or
ecipitated sulphide of iron (which is rarely at hand); to wash
tomach with the stomach-pump; and to administer milk,
te of egg.

nay, even minute quantities, taken for a long time, will pro-
nic lead-poisoning; this may happen in various ways, owing
nifold uses of lead compounds. Thus oxide of lead is used
n wines, the soluble salts are used as hair-dyes, and wafers
coloured with red lead. Again, in grinding the carbonate,
of all paints, the finer particles are liable to be inhaled un-
care is taken. Snuff is sometimes adulterated with lead,
cient may be thus introduced into the system to produce
oisoning. Sir A. Garrod has narrated an instructive case
c lead-poisoning, through the contamination by the leaden

envelope of a packet of snuff. Painters become poisoned by eating their meals with unwashed hands, and so introducing lead into the system. Drinking-water sometimes becomes contaminated with lead dissolved from the lining of tanks: certain conditions of the water either favouring or retarding the solution of the lead. Thus water containing carbonic acid, carbonate of lime, and sulphate of lime, or, in general, sulphates and carbonates, act but little on lead; on the other hand, pure water containing much oxygen, also waters containing organic matters, nitrites, nitrates, and chlorides, act freely on this metal. Carbonic acid is very protective of lead; it crusts the metal with an insoluble covering of carbonate, and protects it from the further action of the water. In the presence, however, of much carbonic acid gas a small quantity of lead carbonate does dissolve (Richter.)

A very small quantity of lead in water is adequate in time to produce all or some of the symptoms of lead-poisoning, even one-fortieth to one-fiftieth of a grain per gallon may suffice. Individual differences exist in respect of susceptibility to lead, some persons becoming sooner affected by it than others: differences sometimes capable of explanation, as will be shown shortly. In contrast to this we find that acetate of lead, in five-grain doses, may be given for weeks or even months, without inducing lead poisoning; this has been abundantly proved at the Brompton Hospital, where the acetate has been employed largely to check the diarrhœa of consumption, yet very rarely causes any lead symptoms, even after the medicine has been continued for months.

Cosmetics and hair-dyes containing lead may cause chronic poisoning.

The symptoms indicative of chronic lead-poisoning are briefly: constipation, with, it may be, impaired digestion, accompanied by a sweetish taste in the mouth, and the development of a blue line at the edges of the gums. The last is produced by the sulphuretted hydrogen developed from the tartar of the teeth, which penetrating the tissues of the gums unites with the lead, forming a black sulphide; the blue line consequently is most marked in persons who do not clean their teeth. It is seen only at the edges of the gums, where they come in contact with the teeth; when the teeth are absent, the blue line is absent. It is first observed, and is always most marked, in the neighbourhood of the incisors. This blue line is one of the earliest indications of the toxic action of lead, and it is one of the slowest to disappear. Garrod says this blue line is never absent if there are any teeth, and that it may affect the whole length of the gums; sometimes it is observed on the contiguous parts of the lips and cheeks. More recent observers have seen cases of lead-poisoning without a blue line. Later on severe colic, with obstinate constipation, and sometimes with vomiting, may set in: colic may occur without any premonitory signs. In lead colic the abdominal walls are retracted, and very rigid; the pain, as in acute lead-poisoning, is mostly eased, though it is sometimes aggravated, by firm pressure.[1] The pulse is small and incompressible (high tension). The general nutrition suffers, the body wastes, and the skin becomes very sallow looking.

Frequent and often severe cramps occur in the calves of the legs, sometimes also in the uterus, penis, and scrotum. The intestines also may suffer, at times almost throughout their length, but generally to a limited extent only. A digital examination of the rectum can sometimes detect or elicit contractions of the bowel. The blood-vessels, like other parts of the body, are said to be subject to cramps. Sometimes the patient is harassed with pains about the joints, generally of the extremities; these are increased by movement or wet weather, and closely simulate rheumatic pains.

Sometimes a paralysis takes place, affecting specially the extensors of the forearm.

The muscles first affected are those supplied by the musculo-spiral nerve (posterior interosseous) in the forearm, and in particular the extensor communis digitorum. The supinator longus escapes, being almost always supplied by a branch from the musculo-spiral nerve before it divides into the posterior interosseous and radial nerves. This fact often enables us at once to discriminate between lead-poisoning and paralysis from disease of the musculo-spiral nerve. If the supinator longus is paralyzed, this fact points to the disease of the musculo-spiral nerve, and then the paralysis is not due to lead. If this muscle is not paralyzed, this fact shows that the disease is limited to the posterior interosseous, and that the paralysis is probably due to the action of lead. The condition of the supinator longus is easily tested in the following way:—Extend the paralyzed forearm on the table, with the radius upwards, then press down the wrist, and tell the patient to try to raise it from the table. The supinator longus, if not paralyzed, immediately becomes hard, contracted, and stands out prominently. (Erb.)

The disease may spread and the muscles of the ball of the thumb waste greatly; in severe cases the deltoid, and even the muscles of the neck and trunk may be similarly affected. In the worst cases, indeed, a general paralysis may occur, with wasting of the muscles of the whole body, the voice even becoming weak through muscular enfeeblement. The paralysis, for the most part, affects motion only, but sometimes there is also loss of sensation. Great loss of the electric excitability of the muscles occurs early, sometimes before the loss of voluntary power.

The muscles are wasted, greyish-red or whitish and tough, with considerable increase of the interstitial connective tissue. These changes are similar to those which occur in injury to nerves, in progressive muscular atrophy, and in the spinal paralysis of children.

How does lead produce this paralysis? On this point various views are held. Some maintain that lead affects the muscles directly, others that it arrests nutrition by exciting strong contraction of the blood-vessels supplying those muscles which are prone to waste. The presence of the "re-action of degeneration," as tested by electricity, shows that the affection is seated either in the nerves themselves or in the spinal cord, and probably in the spinal cord, for the re-action of degeneration and the atrophy pursue exactly the same course as in the spinal paralyses of children.

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[1] Lead colic seems to be dependent upon the constipation present, for when this latter symptom is removed the colic generally disappears.

In the nervous system lead causes hyperæmia and proliferation of the neuroglia, with consequent contraction and degeneration of the cellular elements.

Epilepsy, delirium, convulsions, or coma, may destroy the patient; but death from chronic lead-poisoning is uncommon.

A condition closely simulating general paralysis of the insane is sometimes caused by lead-poisoning.

The kidneys, post mortem, are often found to be cirrhotic; indeed, in many fatal cases, there is more or less general fibrosis. The cirrhosis of the kidney is due, it is said, to the deposits of lead carbonate in Henle's loops, these deposits acting as irritants.

In large doses lead, like the other heavy metals, may bring about inflammation of the grey matter of the cord, and later of the white matter, inducing symptoms like those of acute general myelitis, with rapid wasting of the muscles. Chronic lead-poisoning causes chronic neuritis and myelitis: pronounced optic neuritis may be present.

The influence of lead on the urates in the blood is most singular. Garrod, in his remarkable investigations concerning gout, has elucidated this subject, and shown the intimate connection which exists between lead-poisoning and gout. In gout, as this philosophical observer has shown, the urates, besides being probably increased, are retained in the blood. During the acute attacks, scarcely any uric acid is to be found in the urine, while an abundant quantity is detectable in the blood. The urates dissolved in the blood manifest special affinity for structures such as the cartilages, bursæ, and fibrous tissues, particularly of certain parts, and during the deposition of the urates in these structures, acute inflammation is excited, and this constitutes gout. (*See* Colchicum.)

Now, lead checks the separation of urates from the blood by the kidneys, and so diminishes the uric acid of the urine, whilst augmenting that of the blood, and thus we have the pathological conditions which favour the development of gouty inflammation. Garrod has further shown—and his experience is corroborated by all who have investigated this subject—that gout occurs very frequently among lead-workers, and that gouty patients often exhibit the characteristic lead line on their gums.

There is also the fact, in further confirmation of Garrod's discoveries, that if to a gouty person, free at the time from an acute attack, a salt of lead is administered, it will develop acute gout, with its accompanying symptoms of severe pain and high fever. The author lly verified this fact, first pointed out by Garrod, which an explanation of the good effects of iodide of potassium in of gout in which lead-poisoning is a factor, since, as we ı, this salt promotes the excretion of lead; it, of course, ›lain the use of iodide of potash in other cases of gout.

sed for a variety of purposes, but chiefly for its astringent is action is held to obtain not alone for direct topical but also for parts at a distance from the site of application, se the drug must act either by absorption into the blood, action. On such grounds we explain its use in profuse 'rom the mucous membrane, of the lungs in bronchitis, and ›leeding from the nose, lungs, kidneys, and uterus.

ən conjectured that, in Bright's disease, lead might check ›f albumen from the blood, and therefore lessen the amount urine, and George Lewald has published some experiments rith a view to test this point. He does not mention the ıey disease his patients suffered from, but it was probably ›, flabby, fatty type. He noted at the same time the the lead on the amount of urine voided. These experi- few, perhaps, to decide the question, showed that lead constantly the albumen of the urine, though only to a very t, namely, by about nine or ten grains in the twenty-four ɜ diminution in the albumen appeared to hold no relation ıtity of lead administered. The quantity of water was ısly increased on an average by 200 c.c. in the twenty- here, again, the increase held no proportion to the quantity loyed.

who has investigated the influence of lead-poisoning on the that women working in lead factories frequently abort, e father may cause abortion, even when the mother is not er. Of 123 pregnancies, seventy-three children were born ›f these, sixty-four were abortions, four premature births, ll births at full time. Of the fifty born alive, twenty died year, eight in the second, seven in the third, one later, and ›n reached the age of ten.

w but little concerning the elimination of lead. Only a tity passes off in the urine: iodide of potassium increases ;ion.

NITRATE OF SILVER, OXIDE OF SILVER

A SOLUTION of nitrate of silver, when painted on the skin, colours it first an opaque white, which colour changes gradually to brown and black. The application of a strong solution will produce vesication. Nitrate of silver is sometimes applied as a destructive caustic to warts and other excrescences, but its action being very superficial, it is comparatively useless for this purpose.

Applied to the abraded skin, or to sores, the soluble silver salts form an albuminate which coats the surface with a thin layer and protects the tissues beneath from the irritation of the air. The nitrate of silver acts as a powerful excitant of the denuded tissues and destroys them, but again only very superficially. It is frequently applied to induce healthier growth in unhealthy and unclean ulcers; its action is accompanied by much smarting pain, which, however, soon passes away.

Like most other soluble metallic preparations, the nitrate causes condensation of the tissues as well as contraction of the blood-vessels, on which account it is used to stay hæmorrhage. Being liable, however, to excite much inflammation and pain, other blander astringents should first be tried. Sometimes it is used to check the bleeding from leech-bites, touching these with the solid stick. It would appear that silver nitrate is the most powerful among astringents in its influence over the vessels, the contraction produced in these being very persistent. In respect of this it contrasts with the other well-known astringents, viz., tannic acid, alum, salts of lead, zinc, iron, copper, and mercury; these produce a constringing effect only when the solutions are of medium strength, and this contraction is followed by dilatation if the strength of the solution is too great. (Heinz, *see* Wood's *Therapeutics*.)

Nitrate of silver will prevent the pitting of small-pox, if each vesicle is opened as soon as formed, and the raw surface beneath touched with a solution of the salt. Dr. F. Bowen has recorded an instructive case showing the efficacy of this treatment. He treated the vesicles on one side of the face and neck in the way described, leaving untouched the vesicles on the opposite side, with the result that on recovery the untreated side was deeply pitted, while the opposite side remained smooth and scarless. Dr. Bowen, who has devoted much attention to this subject, states that a nurse can easily carry out the process. At an early stage of the eruption—at the latest on the fourth or fifth day—he punctures the vesicles with a fine needle dipped in a solution containing twenty grains of nitrate of silver to the ounce of water. Mr. Higginbottom finds it unnecessary to puncture the vesicles, and says it is enough to paint the skin in the manner recommended by him in erysipelas in order to subdue the inflammation and prevent suppuration.

ecies of boil which, beginning first as a papule, maturates ule, and further progresses till a large dead core is produced, said, be arrested by painting it over at its very commence- ı a strong solution of nitrate of silver. I have had no of this method, but of the beneficial influence of the collodion on similar boils, to be mentioned in another place, I can ı great confidence.

ıs are best prevented by painting the threatened, but skin, as soon as it becomes red, with a solution of nitrate of grains to the ounce). This has the effect of dispersing the ırdening the skin, and preventing the bed-sore, unless there proneness to this lesion, as, for instance, in cases of para-

of silver will arrest herpes labialis and the vesication of f the warning patch of erythema is painted over before, or as e vesicles have begun to form.

ıes we meet a patient with a patch of lichen, about the size n of the hand, situated indifferently upon almost any part ly, the irritation of which patch may be sometimes so as to break the sleep and so injure the health. The f the patch with a nitrous ether solution of silver, every ry second day, as the itching may require, will generally ffection.

patches of eczema are sometimes benefited in the same rate of silver proves most serviceable after the weeping passed.

ısional application of nitrate of silver or of sulphate of rviceable in psoriasis of the tongue and of the mucous mem- e mouth, but if the affection depends on syphilis mercurial s are better. A weak solution of nitrate of silver, gradually ed, is stated to be useful in the superficial kinds of lupus.

ottom recommends very strongly the local application of silver in erysipelas. No agent, says he, is so safe or so in subduing external inflammations; but, he insists, of the treatment depends entirely on the manner of con- He directs the skin to be well washed with soap and n with simple water, and then to be wiped quite dry; a solution of four scruples of the stick nitrate of silver in ns of water be applied two or three times to the inflamed l for two or three inches outside it.

ate, in solutions of various strengths, is used as an injection œa. Some advocate a very strong solution (twenty grains e), averring that in many instances the disease may at once t by it; others prefer a much weaker solution, one or two the ounce of water, the injection to be repeated several .

Nitrate of silver often cures the intolerable itching of pruritus pudendi. A large camel-hair brush, saturated in a solution containing from two to five grains to the ounce, should be painted three or four times a day over the vulva; the brush should at the same time be thrust up to the os uteri. A stronger solution, used less frequently, will not answer so well.

A weak solution of nitrate of silver often relieves pruritus ani.

Pruritus of the meatus auditorius, occurring without any eruption, should be treated by the application of a strong solution of nitrate of silver, with careful avoidance of the membrana tympani. If the itching arise from undue dryness of the ear, the result of deficient secretion of wax, almond oil or glycerine should be tried first.

When used as an outward application, nitrous ether is by far the best solvent of nitrate of silver, for, by dissolving the fatty matters of the skin, this ethereal solution forms a uniform layer over the surface, in contrast with a watery solution, which, running into drops, leaves the intermediate skin dry. This solution, however, is not available in erysipelas, since nitrous ether will not dissolve the quantity of silver required. It is important to bear in mind that a nitrous ether solution acts much more strongly than an aqueous solution of corresponding strength. The ether solution must, therefore, as a rule, be made weaker, and a strength of five to ten grains to the ounce will generally prove sufficient. Five grains to the ounce is strong enough for threatened bed-sore; a stronger solution, indeed, will often blister, particularly after the application of several coats.

Solutions of nitrate of silver are used to blacken the hair of the head. To effect this the hair is first washed with the solution of nitrate of silver, and then a comb, which has been dipped into a solution of sulphide of potassium, is passed through it; this process results in the production of a dull, lustreless, ghastly, bluish-black colour.

By the ophthalmic surgeon, the solid nitrate of silver stick is sometimes passed over the edges of the eyelids in obstinate tinea tarsi; the eyelashes and scabs should first have been removed.

Again, in conjunctivitis, the introduction, several times a day, of a few drops of a solution of nitrate of silver, of varying strength, into the eye, will often excite in the membrane a healthier inflammation, which thereupon, itself, soon subsides. The solutions may vary from one-half up to five, ten, or in very severe cases, twenty grains of the nitrate to the ounce of water. The stronger solutions may need only one or two applications in all; they should, of course, be employed very circumspectly.

In the mouth the soluble salts of silver have an astringent metallic taste.

The nitrate may be applied to ulcers of the mouth. When it is desired to employ the solid form, and a milder application than the

nic sore-throat, when the tissues are relaxed and covered
solutions of the nitrate are serviceable, but I do not think
n any way preferable to strong astringent and less irritating
ns. Even ulcers are often best treated by the application of,
glycerine of tannin; but if they are in a sloughing and
condition, then the more irritant nitrate must be preferred.
te of silver is applied with doubtful benefit in diphtheria,
orities being agreed that, if used, the application should be
the inflamed patches, for if it extend beyond their area, it
an extension of the inflammation, on which the false mem-
l readily implant itself.

of silver, in powder or solution, is sometimes applied by
a probang, brush, or sponge, to the chronically inflamed
phthisis; or solutions of nitrate of silver, in the proportion of
r. to the ounce of water, may be brought to bear on the
nd larynx by the spray-producer.

ace Green injects a solution of nitrate of silver into the
asthma, bronchitis, and phthisis, after deadening the sensi-
he glottis, by applying to it for one or two weeks a solution
of silver. He passes a No. 10 or 12 catheter, which pro-
y a sensation of warmth, through the rima glottidis, down
he bifurcation of the trachea, and then injects the solution.
Dr. Hughes Bennett, who endorsed this treatment, injected
drachms of a solution containing half a drachm of nitrate
to an ounce of water, or even half an ounce of solution con-
forty grains of nitrate of silver to an ounce of water.
roducing the catheter, the head is to be thrown back, and

Very young children, however, cannot be induced to open their mouths, so as to permit of the inhalation of the spray, hence its use is restricted to children more than two or three years old. These applications, being apt to excite retching, should be employed when the stomach is empty.

Any part of the salt which has escaped conversion in the mouth is changed into an albuminate when it enters the stomach, and if sufficient albumen is not present to effect this completely, the salt will then attack the mucous membrane, and excite in it active inflammation. The best antidote for a poisonous dose of silver nitrate is common salt: a fact useful to bear in mind, if, as sometimes happens, the solid stick of nitrate breaks off and is swallowed. Chlorides are so abundant in the tissues and the fluids of the body that it is probable that much of the silver, taken in the ordinary way, suffers conversion into chloride.

Nitrate of silver acts as an irritant to the stomach, and may be used in precisely the same class of cases in which arsenic is applicable. It often checks the pain and vomiting of chronic inflammation, of chronic ulcer, and even of cancer of this organ. It should be given not in the form of pill, but in solution.

The nitrate acts as an astringent to the intestines, and, in common with several other metallic preparations, may be used in diarrhœa, both of the acute and chronic kind.

Nitrate of silver is sometimes very useful as an injection in acute and chronic dysentery (ʒj. to three pints of injection).

Peptones dissolve the nitrate readily, and this solution does not coagulate albumen. Silver enters the blood probably in this form and collects in the red corpuscles, as other metals tend to do, if not speedily deposited in the organs or separated by the secretions. The red corpuscles are said to become paler, and the hæmoglobin to be converted into hæmatin, and it has been conjectured that this change explains the slight fall in temperature noted after large doses of silver salts. These salts, being absorbed, are supposed to be astringent to the tissues to which they are conveyed; but this is a doubtful supposition, and they are never used to check either the bleeding or excessive secretion of distant organs of the body.

In poisonous doses nitrate of silver excites, in animals, convulsions and paralysis, probably central in origin; the convulsions are very similar to those produced by strychnine, and are excited by the least peripheral irritation. Death is said to be due to asphyxia, and after death the lungs are found congested and œdematous and the bronchial tubes choked with mucus. Injected into a vein, nitrate of silver destroys contractility of the cardiac muscle.

Chronic poisoning by nitrate of silver produces loss of appetite, impaired nutrition, albumen in the urine, rapid and irregular action of the heart, and after death there is found general fatty degeneration, ially of the kidneys, liver, and heart. The silver, in some form, bly as the reduced metal, is deposited in all the tissues of the except the rete Malpighi; it is found most abundantly where the is finest and most vascular. Once deposited, the metal remains as manent discoloration, of a deep leaden hue, irremovable either by or treatment, unless it should prove true that large doses of e of potassium, as has been lately stated, will wash out the stain. W. Pepper finds that the staining of the skin is always preceded dark line upon the gums. Silver appears to be eliminated chiefly he intestines and bile, very little escaping in the urine.

oth the oxide and the nitrate are employed in chorea and epilepsy, rently with occasional benefit. The oxide has been given to check use sweating.

e symptoms and morbid anatomy of chronic poisoning by silver s indicate with conclusiveness that the salts are absorbed and cir- te, and, though it is not conceivable that they should, whilst circu- g, exert any astringent action upon the tissues, inasmuch as, by time they have entered the blood, they must have fully saturated r affinity for albumen, yet that they are capable of exerting other ences is proved both by the symptoms and the post-mortem changes rded. The name alterative is generally applied to the kind of temic action here witnessed. However named, we use the silver s therapeutically, for the effects they are able to produce after orption, in the following conditions: the profuse sweating of atonic tes, for this the oxide is generally administered in the form of pill; tain nervous affections, *e.g.* chorea and epilepsy, notably the latter.

W. Murray, of Newcastle, has recently drawn attention, again, to value of salts of silver in cases of epilepsy rebellious to the mides, or in which the bromides, though efficient in suppressing the acks, do so at the expense of the mental faculties, and, indeed, to incapacitating extent. He says rightly that the danger of the ining of the skin which a course of silver involves is a compara- ely small price to pay for the benefits which such a course *may* ing. Where silver succeeds, he thinks that besides the suppression control of the fits, the patient retains his normal alertness of mind perilled by the bromides, and also escapes minor ailments, such the neuralgias. Dr. Murray instances two such cases of prolonged lver treatment with most excellent results; in one case the course sted nine months. The risk of argyria should of course be put before e patient [*Rough notes on Remedies*].

MERCURY AND ITS PREPARATIONS

THE salts of mercury possess very various physical as well as chemical properties, but as in every instance their effect *on the system* is well-nigh the same, it is probable that all mercury compounds ultimately assume the same form in the blood. On the other hand the direct *topical* action of mercurial preparations depends very greatly upon the nature of the salt.

The nitrates of the oxide and suboxide are escharotic, but much of this action is due to the free nitric acid of these salts. In general the mercuric salts are more active, locally, than the mercurous salts, but degree of solubility affects much this question of activity. The nitrates, as amongst the most active salts, are used to remove warts, condylomata, and other slight excrescences.

Mercurial applications will completely allay the annoying itching of certain skin affections. For this purpose the solution of the bichloride, the black-wash, and yellow-wash, and the mercurial ointment, may each prove useful, but the application should be a strong one. Trousseau recommends highly the bathing of the part with a solution of about twelve grains of bichloride to the pint of very warm water. After much experience of these applications, I believe that by far the best application is an ointment composed of a drachm of calomel to an ounce of lard; but this ointment, in common with other mercurial applications, is not useful in all kinds of itching; for instance, it is unavailing in the irritation of urticaria.

Calomel ointment often removes immediately pruritus ani and the itching of neighbouring parts. This irritation may be due to the presence of rashes such as psoriasis, lichen or eczema, or there may be no eruption visible. In each case the ointment may prove equally efficacious. This application is less frequently useful in pruritus pudendi. In obstinate cases of pruritus ani and pruritus pudendi, blisters to the thighs, or the application of a few leeches, will sometimes afford relief.

In many instances the ointment improves the condition of the rashes themselves, but this is in some measure due to the cessation of the scratching, upon the disappearance of the itching.

Sometimes there occurs, in children, a little scabbiness of the head, looking like a mild eczema, but accompanied by a degree of itching sufficient to prevent sleep and to cause constant restlessness. The calomel ointment speedily relieves this irritation.

The inunction with calomel ointment allays the distressing itching of the scalp which sometimes accompanies pityriasis, and calomel may be profitably added to other ointments used for the removal of pityriasis, such as the ointments of the oxide of mercury and of tar.

It may be objected that so concentrated an application of mercury, especially when applied to soft and absorbing parts, such as the inner ace of the vulva, and the skin around the anus, must surely pro- e salivation. No doubt care should be exercised, and no more ment used than is needed, yet the risk of salivation seems to be emely slight, for, with a very large experience of the use of this ment, I have never seen salivation produced by it. Properly lied, a very small piece of ointment is generally sufficient to allay irritation at once, and even to remove it altogether within a few s; it is, however, very apt, after a variable time, to return, but it l again yield to a renewed employment of the unguent. Its bene- al effects are often almost instantaneous, though sometimes it takes ew days to give ease. Having many times seen it succeed when er remedies have failed entirely, I am convinced of the value of this plication in these harassing and perverse diseases. An ointment mposed of five to fifteen grains of menthol to an ounce of spermaceti tment is also very useful. The smaller quantities should be tried st, as the larger may prove too irritating.

Next the irritant ointments of mercury are useful in that obstinate d disfiguring affection, tinea ciliaris. The eyelashes having been cut ort, the ointment, either of the nitrate or of the oxide of mercury, ould be applied night and morning, the scabs being picked off before ch dressing. It is a common practice to dilute the unguentum drargyri nitratis with from four to six parts of simple ointment, hether it be used for rashes generally or for tinea ciliaris; but in any instances the undiluted ointment is best, and it seldom requires be reduced by more than half the official strength, for, indeed, the ilure of the ointment in eczema, psoriasis, lichen, and tinea ciliaris, often due to its employment in too weak a form. Mr. Hutchinson d others assert that epilation ensures the speediest cure. Should ese stimulating applications fail, others more powerful should be ied, such as the nitrate of silver, or sulphate of copper, the last- med salt being preferable, because it gives less pain.

Patches of obstinate lichen and psoriasis, especially of the hands, en when not syphilitic, will sometimes yield to mercurial ointments hen milder treatment fails. The calomel and nitrate of mercury ntments may be mixed; the addition of tar ointment will, sometimes, crease still further the efficacy of this combination.

Citrine ointment, *i.e.* the unguentum hydrargyri nitratis, is also very eful in some cases of eczema, even in the weeping stage, if there is ut little accompanying inflammation, but it is more markedly useful the stage of desquamation when the oozing has ceased. It is ery serviceable when eczema affects the hairy parts of the face, and ten cures this obstinate affection when other remedies have been ied in vain; even when it fails to cure, it generally subdues the isease in great part. The same ointment is very beneficial, likewise, pityriasis of the hairy parts of the face. In both eczema and ityriasis it is better to mix the citrine ointment with tar ointment, though this combination is sometimes more irritating than the simple citrine ointment, and cannot be borne, whereas the citrine ointment, pure or diluted, proves very useful. In general eczema Nayler has used the mercurial vapour bath.

In the early stages of acne, a lotion composed of: corrosive sublimate, one part, alcohol, enough to dissolve the sublimate, water, 100 parts, is said to be of use. A teaspoonful of this solution is to be added to a quarter of a pint of water (*i.e.* 1 in 4,000), and the face sponged with the lotion night and morning. The bichloride lotion after a time produces a "scaliness and hardness of the cuticle."

Mercurial preparations exert a powerful destructive action upon the lower forms of animal and vegetable life. Bichloride of mercury, one of the best of parasiticides, is useful in favus, tinea sycosis, tinea tonsurans, eczema marginatum, and tinea versicolor (chloasma). A lotion containing two grains of bichloride to an ounce of water is generally sufficiently strong. In favus, and tinea sycosis, and tinea tonsurans, the lotion should be applied after each epilation, and should be continued for some time after epilation has been stopped. This treatment is highly spoken of by McCall Anderson.

The ointment of the white precipitate, or of the nitrate of mercury, or corrosive-sublimate wash, will destroy the various kinds of lice and their nits, which infest the different parts of the body. For lice on the pubes it is necessary to apply the ointment or lotion to the scrotum, and to the hair of the perinæum, and around the anus. The nits can be dislodged by washing the hairs with spirits of wine, which dissolves the gluey matter attaching the nit to the hair. The body-louse may be killed by the essential oils, such as the oil of rosemary, or by powdered pyrethrum, or by an ointment of stavesacre. Through the groundless fear of inducing salivation some prefer these latter to mercurial applications. In each case the under linen should be boiled to destroy any hidden lice.

It is taught, on high authority, that the use of mercury ointment in onychia and paronychia is very useful; the application should be repeated for ten minutes every hour, poultices being applied between times. It may be mentioned here that Dr. Scott reports several striking cases of cures by dusting the nitrate of lead on the diseased tissues night and morning.

Mercurial ointments are useful in erythematous lupus. I have seen great advantage result from the use of calomel ointment or black-wash in the scrofulous lupus of children, and in open scrofulous sores. Scrofulous sores that had resisted other treatment I have often seen yield speedily to the application of calomel ointment.

In lupus, Nayler has advised the touching of the summit of the tubercles with the solution of the acid nitrate of mercury, the application to be repeated till the tubercles have been reduced to the level of the skin, but not deeper, or a scar will result. Each application

l in chronic inflammation of the knee-joint. For such and other
atory affections, the late Mr. John Marshall introduced a mer-
reparation, the oleate of ~~mercury~~, ~~which~~, varying in strength
g to the needs of the case, might be employed separately or
l with other remedies. Mr. Marshall's paper is so practical
able, and so insusceptible of condensation or abridgment, that
deemed it best to reproduce the larger portion of it. "These
ions," he says, "are cleanly and economical, and have a much
liffusibility or penetrating power than the old mercurial oint-
or they are absorbed by the skin with remarkable facility, and
; the remedial effects with great promptitude."

should not be rubbed in like ordinary liniments or embrocations, but
merely applied with a brush, or be spread lightly over the part with one*
herwise they may cause cutaneous irritation, or even produce a few
on the skin, especially in certain persons. This result may, however,
ed by the addition of a small quantity of olive oil, or purified lard,
; as an oleaginous or an unctuous preparation is required. Any of
ns may be scented by the addition of essential oils.
nploying these mercurial solutions for combating persistent inflam-
f joints, I soon found that the addition of morphia was of very great
e. For this purpose the simple alkaloid must be used, as neither
ochlorate, the acetate, nor the meconate, is soluble in oleic acid. For
achm of the solution of oleate of mercury in oleic acid one grain of
may be added. Being, as well as the mercury, completely dissolved,
as rapidly penetrates the skin, comes quickly into contact with the
es of the nerves, and thus, even within a few minutes, acts upon
heir most sensitive points, and speedily produces a soothing effect.
leates of mercury and morphia, thus united in one preparation, re-
s it were, a liniment, ointment, or plaster of mercury and opium;
are far more elegant, economical and efficacious. As a rule, accord-
size of the part affected, from ten to thirty drops are sufficient for one
on. This should be repeated twice daily for four or five days, then
only for four or five other days, and afterwards every other day
ure is obtained. The morphia immediately begins to relieve pain,
e nervous irritation, and consequent vascular turgescence; and thus
ne progress or 'persistence' of the inflammatory process; whilst the
probably promotes the death and degeneration of the morbid pro-
d so facilitates their subsequent removal by absorption. Unless used
ive quantity, the oleate of mercury does not salivate, or produce any
onstitutional disorder."

arshall says, "their applicability and utility appear to me to
st co-extensive with the occurrence of 'persistent' or chronic
ations, provided only that the seat of the disease be in, or
tly near to, the skin."

y first mention that not only in persistent articular inflammation,
in simple synovitis, these remedies *rapidly* relieve the tenderness and

pain, and promote the absorption of the fluid effused into a joint. They are also of decided benefit in the rheumatic, the arthritic, and the mixed forms of joint disease: but in these they do not, of course, supersede the necessity for general treatment. In inflammation of the mammary gland, occurring during or after lactation, or altogether independently of that secreting process, their efficacy is unequivocal; for I have seen not only the induration left after previous abscesses speedily disappear under their use, but a tendency to recurrent suppuration in the site of old abscesses, and the threatened formation of new ones, entirely controlled and arrested. I have also seen a threatened abscess in the perinæum from inflammation of one of Cowper's glands, and likewise the troublesome indurations left after ordinary perinæal abscess, rapidly disappear on the use of these preparations. In obstinate and painful tonsilitis, in epididymitis, in periostitis, and in inflammation with imminent or actual suppuration in or around lymphatic glands, I have similarly employed them with decided advantage. In hydrocele they have not appeared to be useful. I have used equal parts of the 20 per cent. ointment and purified lard applied outside the eyelid with success, in hordeolum, and in palpebral conjunctivitis.

"In many cutaneous affections the oleate of mercury solutions, without morphia, form elegant and powerful remedies. It was in a case of obstinate sycosis menti that I first used, and with excellent results, an etherial solution of the perchloride of mercury mixed with oleic acid; but I now much prefer, as equally efficacious, and far less irritating, the 5 per cent. solution of oleate of mercury in oleic acid, with the addition of an eighth part of ether. (Dr. Aldersmith employs a 10 per cent. solution.) This, when applied to the skin with a camel-hair pencil, is a most diffluent and penetrating remedy. It enters the hair follicles and the sebaceous glands, penetrates the hairs themselves, and carries everywhere with it its powerful metallic constituent. Besides sycosis, it will cure chloasma and the various forms of tinea; it is useful in porrigo, and in pruritus ani et pudendi; but I have not found it serviceable in non-specific psoriasis, or in eczema. The solution of oleate of mercury destroys pediculi immediately; and, owing to its singular power of permeation, simultaneously kills the ova—a result not always certain when ointments containing undissolved mercury are used.

"Again, in many of those syphilitic affections for the cure of which mercury is applicable, the oleate of mercury preparations offer some advantages. Thus, in congenital syphilis, a piece of the 20 per cent. ointment, about the size of a pea or bean, placed in the child's axillæ night and morning for five or six days, rapidly and easily, and without any signs of uncleanliness, produces constitutional effects. Even in the adult this mode of introducing mercury into the system, either for the cure of syphilis or other disease, may be often preferable to, and less troublesome than, the bath, and it certainly gets rid of the objections to the ordinary mode of inunction. As a topical remedy for certain local manifestations of syphilis, such as the non-ulcerated forms of syphiloderma, especially when these disfigure the head, face, neck, or hands, the 10 per cent. solution is a most valuable adjunct to other treatment, the spots rapidly disappearing under its use. This, or the 20 per cent. preparation, diluted with equal parts of purified lard, may also be applied to non-ulcerated syphilitic indurations and condylomata, but it gives pain if applied to surfaces much excoriated or ulcerated, to moist warts, or to mucous membranes. In syphilitic iritis, and also in non-specific forms of that disease, this diluted oleate ointment smeared over, not within, the eyelid, evidently promotes the absorption of the effused lymph. Lastly, in some of the remoter kinds of syphilitic affections, which iodide of potassium will

such as very hard nodes and certain forms of syphilitic testicle,
application of the oleate of mercury is very valuable. I have
f enlarged testicle, epididymis, the syphilitic origin of which had
pected, and for which no mercurial course had been prescribed,
uring a period of six years, had been, from time to time, relieved
doses of iodide of potassium, speedily and decidedly benefited by
n of the 20 per cent. mercurial oleate.
nce to other uses of the combined oleates of mercury and morphia,
k that I cannot doubt their value in the treatment of 'persistent'
n of certain internal parts and organs—as, for example, of obsti-
y, pneumonia, pericarditis, and endocarditis; for they would here
ain and nervous irritation; would thus contribute towards the
ogressive disease, and would likewise promote the process of
Moreover, I may state that a solution of morphia in oleic acid
grains to the drachm without mercury), is an excellent topical
euralgia, and in that exquisitely painful affection, herpes zoster,
ken not to produce cutaneous irritation by friction. I have also
nically, with advantage, a solution of atropia in oleic acid, and
epared for me the oleates of zinc and copper. Each of these pre-
ill probably come to have its uses, to which, however, I have now
hus generally to refer. Oleic acid is likewise a ready solvent of
and croton oil. It is itself aperient, and permeates fæces more
olive oil. Indeed, I fully anticipate that this acid, as well as its
vith mercury and with morphia, besides other preparations made
will eventually be admitted into the Pharmacopœia. An oint-
oleate of mercury would almost supersede the old-fashioned blue
hilst the solutions of the oleates might replace the liniment of
he remaining mercurial ointments of the Pharmacopœia, of which
nay contain a little oleate or some allied salt, will, however, still
pecial uses.
te must be prepared with the oxide precipitated by caustic potash
n a solution of the metal in nitric acid recently made and well
solution of mercury by oleic acid is assisted by a temperature of

r cent. solution is a perfectly clear, pale yellow liquid, resembling
t thinner; the 10 per cent. solution is also fluid and perfectly
dark as linseed oil; whilst the 20 per cent. preparation is an
owish, unctuous substance, closely resembling in appearance resin
elting very readily at the temperature of the body, and forming
ransparent, viscid, colourless varnish when applied to the skin.
are to be observed in the manufacture of these solutions is not to
rocess, and not to employ a high temperature, or the mercury will
ely reduced."

ent of the biniodide of mercury has been employed largely in
with remarkable success in the treatment of goitre. The
he ointment is aided by the effects of the sun's rays, to
tumour is exposed after inunction. The ointment is pre-
he following way:—Melt three pounds of lard or mutton
, and clean; when nearly cool, add nine drachms of binio-
cury, finely triturated; work the mixture well in a mortar
ns of red are visible, and keep it in pots, protected from the
India this ointment is *applied to* the swelling at sunrise by

means of an ivory spatula, and is then well rubbed in for at least ten minutes.

The patient then sits with the goitre held up to the sun as long as he can endure it. In six or eight hours there will probably be some pain from the blistering action of the application, although no pustules will have arisen. At about two o'clock in the afternoon a second application is made, the ointment being rubbed in with a light hand; the ointment is then allowed to remain, and its absorption is completed about the third day. In ordinary cases one such course cures the patient, but in bad cases it may be necessary to repeat the treatment in six or twelve months. In countries where the sun is less powerful, the patient sits before a fierce fire; or the ointment may be rubbed over the swelling night and morning, afterwards covering it with oil-skin. The full effect is produced in a few days, upon which a mild ointment like spermaceti is substituted. (Stainthorpe.)

At one time the application to the face of mercurial ointment, or of mercurial plaster, was in vogue to prevent the pitting of small-pox. It has been a question of interest here whether the mercury itself plays any part in arresting the maturation of the pustules, or whether other applications are not as effective. A good deal has been said on each side of the question, but I think that, inasmuch as several instances of very severe salivation have followed this plastering in small-pox, other safer remedies should be used, for though, perhaps, they may not act with equal benefit, yet they give sufficiently good results to render it desirable to employ them in preference to mercurial compounds.

The exclusion of light and air thwarts probably the development of the pustules and prevents pitting. But the exclusion of air and light can be effected perfectly by collodion and india-rubber dissolved in chloroform; this, or other means, should therefore be employed in preference to mercury compounds. (*See also* Nitrate of Silver.)

Half a grain of bichloride of mercury in six ounces of water, applied every two, three, or four hours, is a good injection in gleet.

Mercurial preparations, especially black-wash, are very useful applications to syphilitic sores; mucous tubercles soon yield to the latter. Black-wash is useful also for those elevated indurations occurring at the anus of children, differing from mucous tubercles, being of much larger size, of irregular shape, often limited to one side, and generally extending some way up the rectum. This eruption, which may bleed and smart severely each time a motion passes, often disappears but slowly under the influence of mercury administered by the mouth, and may, in spite of it, continue increasing slightly for months, while if kept constantly moist with black-wash its removal may be assured within ten days or a fortnight. Black-wash is very useful in other syphilitic sores.

When it is not convenient to apply black-wash, calomel or citrine ointment, well rubbed in, may be substituted.

Calomel, dusted over syphilitic condylomata, generally removes them.

Cyanide of mercury, in solution, in the proportion of five, ten, or fifteen grains to an ounce of water, is useful as a local application to syphilitic rashes and sores, such as those of the throat, tongue, anus, penis, etc. For sores on the prepuce or glans a solution of five grains to the ounce is generally strong enough, and even this strength excites sometimes a good deal of smarting. It should be thoroughly applied with a camel-hair brush, once, or at most twice a day, carefully avoiding the neighbouring healthy tissues. In case of chancres it is a good plan to apply this lotion daily, or to keep the sore moist with lint soaked in black-wash. Mercurial ointments rubbed into the skin of the penis are apt to bring out a crop of eczema, with considerable swelling.

Mercurial applications mixed with other substances, such as tar, are very useful in syphilitic psoriasis.

In the syphilitic ozœna of infants, mercurial ointments, such as the nitrate of mercury ointment, partially melted and applied twice a day after the nose has been well cleared, will arrest the secretion, remove the obstruction, and improve the condition of the mucous membrane. The child's health will improve also, for the nasal obstruction prevents the act of sucking (during which the child is unable to breathe); accordingly the ointment by causing the removal of the obstruction permits of a better taking of the food. It is well known, further, that a child, especially in sleep, breathes only through the nose; the health consequently must yet again suffer when the nasal passages are blocked through an inability to sleep: in respect of this also the above treatment will be beneficial.

In non-syphilitic ozœna Trousseau employs the following snuff powders:—White precipitate 4 grains, sugar in fine powder 232 grains; or, red precipitate 4 grains, sugar in fine powder 232 grains. The nose is first cleared by blowing it strongly, and then a pinch of either powder is snuffed up a few times daily for a few days. The stench is quickly removed, and the state of the mucous membrane modified; but sometimes the powders irritate too powerfully, and, unfortunately, they do not cure this very intractable complaint.

Baths of corrosive sublimate and chloride of ammonium, in the proportion of half an ounce of sublimate to one ounce of the chloride to the bath, are sometimes useful in the treatment of obstinate syphilitic and non-syphilitic rashes.

Mercurial fumigations are very successful in syphilis; for these calomel, which is undecomposed by heat or moisture, and gives constant results, is employed. Some employ calomel in the form of a dry fumigation; others maintain that its therapeutic effects are increased by the presence of steam. This mode of employing mercury as a means of introducing it into the system is considered the best and surest way of eradicating syphilis, and, moreover, one by which the general health is less deleteriously affected, since neither the functions of the stomach nor of the intestines suffer. Ten to twenty grains of calomel are used at each fumigation.[1] The fumigations produce sometimes so much weakness and prostration that they cannot be continued. There can be no doubt that many cases of syphilis, rebellious to other treatment, yield to these fumigations. Sometimes only that portion of the body which is affected by the syphilitic rash is subjected to the calomel fumigation. In this case the fumigation will be employed for its local action as well as for absorption.

Mercurial applications, but especially the mercurial and calomel ointments, are also rubbed into delicate parts of the skin in order to mercurialize the system by their absorption. This method has the advantage of not disordering the digestive canal. Twenty to sixty grains of mercurial ointment may be rubbed in every night, or every other night, according to circumstances. (Arthur Cooper.) The site of the inunction should be varied. The inner aspect of the thighs is suitable for this purpose, also in young children the axillæ. In adults the latter are less suitable, since the inunction is liable to cause inflammation of parts covered with hair.

Bichloride of mercury has been injected under the skin, and by this method a much smaller quantity affects the system than when the drug is administered by the mouth; this painful mode of treating syphilis is not likely to become general. It has, however, been practised extensively, and has the advantage of bringing the system more rapidly under the influence of mercury. Bloxam recommends that ten minims of a solution of sal alembroth, containing half a grain of the double chloride, should be injected deeply into the buttocks; this dose is repeated once or twice weekly, at first, and subsequently once a week, or less frequently according to circumstances. Arthur Cooper speaks well of a solution containing one grain of the red iodide of mercury, and a sufficiency of the iodide of sodium in sixty-four parts of water; of this the dose is six to eight drops.

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[1] The patient, completely undressed, is seated upon a cane-bottomed chair, beneath which a spirit-lamp arrangement for heating a tile or ordinary brick has been safely placed. Upon the hot brick the calomel dose is sprinkled. A circular macintosh or blanket, falling from the patient's neck to the ground, encircles completely both him and the chair. If it is wished to conjoin the action of steam, this is easily arranged for by placing in addition some little apparatus for heating water. Great caution should be observed that the patient's chair and blanket are perfectly secure from the flame of the lamp. An assistant must be present. The bath may last 15–20 minutes. It should be repeated twice or thrice weekly, watching the effect. After the bath the patient lies down for awhile wrapped in dry blankets.

Numerous other preparations of mercury have been used, *e.g.* grey l, the salicylate, benzoate, and peptonate of mercury, etc. In each ase the deep or intramuscular injection is probably the best to ractise.

Mercury then may be introduced into the system by fumigation, by nunction, and by hypodermic injection; the most usual way, however, is by administration by the mouth.

By whichever means introduced, mercurial medicines, if administered for an undue length of time, injure severely the mucous membrane of the mouth and the salivary glands. The first symptom is a disagreeable metallic taste, the gums around the teeth become swollen and tender, and of a dark-red colour, the mucous membrane investing the incisor teeth being the part first affected; next the tongue swells and becomes thickly coated, and the breath is excessively fœtid; by this time the secretion from the buccal mucous membrane is much augmented, and the saliva is increased in quantity even to the extent of one or two pints daily. At first the saliva is richer than natural in epithelium and solid constituents, but after a time it becomes clearer, more watery, and is found to contain fat and mucous corpuscles: the salivary glands will have now become swollen and painful. At last the inflammation of the mouth reaches such a point that ulceration sets in, and it may progress till large portions of the gums and cheeks are destroyed, the teeth have become loose, and the bones of the jaw carious. Some people are much more prone to become salivated than others, weak persons being more easily affected than strong; children are rarely salivated. Disease also influences the activity of mercury, for in inflammations it is often well borne, while in glandular disease of the kidneys and in scrofula, patients are very liable to become salivated. It is stated that salivation has occurred three hours after a dose of mercury; that in certain cases it may last a few hours only, whilst in others it may endure for several years; it is also said that salivation having set in, it may disappear for a time and then return.

The prolonged and undue employment of mercury produces other serious mischief: the body wastes, the blood becomes much impoverished, and "mercurial fever" may be induced; this latter is sometimes accompanied by pustular or vesicular eruptions. The pyrexia is attended by a sensation of heat, by thirst, loss of appetite, nausea, vomiting, and purging; sometimes the stools are bloody. In mercurial tremors we have another toxic symptom; in this affection weakness in the upper extremities is first noticed, the voluntary movements begin to lack their usual precision, and soon slight tremors set in, and gradually increase both in severity and extent till finally the whole body becomes involved: the legs are attacked before the trunk. These tremors are easily excited, cannot be controlled, and persist for some time. In bad cases almost every part of the body is affected by severe spasmodic movements, so that the respiration, even, is spasmodic; the sufferer may be unable to walk or talk, and in some cases finds it difficult to masticate. There may also be neuralgic pains, loss of memory, headache, delirium, and even convulsions. Salivation is sometimes absent, the mode of poisoning influencing greatly the effect of the mercury; thus, while inhalation generally produces tremors,—inunction, and still more, administration by the mouth, produce salivation. Inunction, however, has produced tremors. Complete recovery generally takes place, provided that the patient is removed from the influence of the mercury before the disease has greatly advanced. The nervous symptoms are usually produced slowly, but they may occur after only a short exposure to mercurial vapour, and Dr. Christison narrates a case where one night's exposure to the vapour from a pot of mercury on a stove produced tremor which lasted for life.

The treatment of mercurial poisoning consists in the use of simple or of sulphurous baths, and the administration of iodide of potassium. The influence of iodide of potassium on mercury in the system has been spoken of elsewhere.

Exceptional action, both as to the symptoms produced, and the dose requisite to produce, is witnessed in the case of mercury as of other drugs: these come under the heading of idiosyncrasy. We may also meet with vagaries, or, as it were, freaks, in the action of mercury; thus, there are persons who can never take even a small dose of the drug without suffering from toothache; this generally selects a carious tooth.

With the exception of the sulphide,[1] all mercury compounds enter the blood, and are employed in a variety of diseases on account of their action on distant organs.

Small doses of corrosive sublimate increase the weight of healthy men and animals, augmenting also their red corpuscles. Mercury given in excess, as already described, decreases the red corpuscles. Given in simple anæmia in small doses, the corpuscles increase for about fourteen days, then a slight reduction follows; the hæmoglobin increases till the twenty-fourth day, then falls again. The hæmoglobin increases in greater proportion than the corpuscles. In syphilis accompanied by anæmia, mercury in small doses increases the red corpuscles and their hæmoglobin, and diminishes the white corpuscles. It is essentially in this specific form of anæmia that mercury is indicated—not in the other forms.

Mercury remains a long time in the body, and may accumulate, so it is said, in globules in the cancellous structure of bone. Whatever the form in which it may be locked up in the tissues, it certainly does tend to accumulate.

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[1] We may not perhaps wholly exclude the sulphide from absorption, but of all compounds it appears to be least capable of absorption.

Mercury salts are to some extent eliminated by the kidneys, by the mucous membrane of the intestines, chiefly as sulphide, and by the liver, in the bile; indeed, it has been found in every secretion, physiological and pathological.

We may now proceed to consider the action of mercury compounds upon certain important organs or systems, and the application of this action in the treatment of disease. The alimentary tract claims our attention first.

The soluble preparations of mercury combine with the albuminous matters in the mouth, and any portion left uncombined attacks the mucous membrane, and, if in quantity, may excite in it acute inflammation. There will be a similar action in the stomach.

To pass to therapeutic application: a form of vomiting is sometimes met with in very young children—generally only a few weeks old—which yields in many instances to grey powder or calomel, but especially to grey powder. The chief, and to a great extent characteristic, feature of this vomiting is its suddenness and instantaneousness; immediately the milk is swallowed it is forcibly expelled, curdled or uncurdled, apparently without any retching or effort on the part of the child. The milk literally shoots out of both mouth and nose. Diarrhœa may exist, but more generally there is constipation. This affection often proves both obstinate and dangerous, all the food being rejected, until the child, reduced almost to a skeleton, dies actually of starvation. At the *post-mortem* it often happens, either that nothing is found to account for death, or that the mucous membrane is discovered to be much softened, and like water arrowroot in consistency and appearance. One-third of a grain of grey powder, repeated every two or three hours, will, in many instances, quickly stay this vomiting, which may resist all other remedies. A twelfth of a grain of calomel every two hours is sometimes equally successful.

On the alimentary tract below the stomach the soluble preparations act next as purgatives, increasing the secretion from the mucous lining of the bowel and enforcing the contractions of the muscular coat of the intestines. Not all mercurial compounds, however, are employed as purgatives, and, when purgation is needed, our choice falls either on blue pill, calomel, or grey powder; either of the two latter, being tasteless, is a useful preparation for children.

Most purgatives act more efficiently when given in small doses, at frequent intervals, say, every hour, but this does not hold for calomel. Neither, according to my experience, do we much increase the purgative effect of calomel by augmenting the size of the dose; thus a grain may act as energetically as five grains. As an occasional purgative calomel is most valuable, but where a nightly purgative is needed it does not answer, for the dose adequate to produce four or five motions the first night may act only twice or three times the second, and often not at all the third.

The special influence of mercury salts on the pancreatic and biliary secretions is still undecided. Seeing the influence of mercury on the salivary glands, some have conceived it probable that it exerts a similar influence upon the pancreas, a gland which in its structure and secretion is very similar to the salivary glands.

Most opposite statements have been made concerning the action of mercury on the secretion of bile. From experiments on animals it has been concluded, though not without dissent, that mercury in health diminishes the secretion of bile. In his report, as secretary of the Edinburgh committee appointed to investigate this matter, the late Dr. Hughes Bennett arrived at somewhat the same conclusion. This report states: (1) That neither blue pill, calomel, nor corrosive sublimate, affect the bile unless they purge, or impair the health, in which case the quantity of bile is diminished. (2) That during an attack of dysentery, both the solid and fluid constituents of the bile are diminished. (3) That purgation from any cause lessens the amount of bile and the proportion of its solid constituents. (*See* Podophyllum.)

Röhrig and Rutherford have re-investigated this subject, and they conclude that calomel does not increase the secretion of bile, nay, in purgative doses, that it may even decrease it. Rutherford finds, however, that the bichloride of mercury does increase the secretion of bile.

Dr. H. Bennett's committee experimented on dogs fed regularly. Rutherford and Röhrig, on fasting dogs; in every instance they first paralyzed the animal with curare. They inserted a glass cannula into the common bile duct near its junction with the duodenum, then compressed the gall bladder to fill the tube with bile, and clamped the cystic duct. They then closed the wound in the abdomen, and collected the bile as it flowed through the cannula.

In some experiments Rutherford placed the calomel in the duodenum unmixed with bile, in others mixed with it; in yet others he administered the calomel by the stomach.

In spite of these results the experience of generations supports strongly the conviction that in some diseases calomel (as well as other preparations of mercury) does increase the bile. Moreover, it is not difficult to conceive that in a given disease mercury may set aside some condition hindering the formation of bile, and thus act as a cholagogue, though possibly in health it may even check this secretion. It is certain that small doses of mercurial salts will restore colour to colourless stools; their efficacy to do so may be tested over and over again in children, among whom we often meet with cases in which for weeks quite colourless stools are passed. In such cases grey powder will restore the colour, and this result can be obtained many times in succession in the same patient, since it often happens that some time after the discontinuance of the mercury the colour again leaves the motions.

When given to promote the secretion of bile, the common practice to give a purgative dose for one or two nights, but if there is no onstipation there is no need to purge, and a small dose, say one-ixth to one-half grain of grey powder twice or three times a day, will be found to answer better. The administration of small doses requently is especially advantageous in cases where the illness is apt o recur from slight and scarcely preventible causes, and where the frequent employment of purgative doses would favour after-constipation, and produce depression and possibly salivation. For these last-named reasons it is common to hear highly practical doctors decry mercurial preparations, whereas were they to employ the minute doses now recommended they would obtain the desired effect and exclude the bad results they fear. Given in the doses just mentioned, mercurial preparations are signally useful in certain cases which I will now indicate.

I. A patient voids pale clayey stools and suffers from acidity, flatulence, or vomiting; the symptoms occurring sometimes only before breakfast. Half a grain of grey powder given three times a day will often restore the colour to the stools, and upon this the dyspeptic symptoms may at once cease.

II. In a form of diarrhœa common among children and presenting the following symptomatology: the child's health is bad; the digestion is imperfect, and is generally associated with annoying flatulent distension, and the passage of three or four pale, clayey, pasty, stinking motions during the day. A single grain of the bichloride dissolved in half a pint of water, and administered in teaspoonful dose each hour, or, still better, one-third of a grain of grey powder every hour or two hours, will in one or two days limit the number of the stools, and restore to them their natural bilious colour, even though they may have been clay-coloured for weeks.

III. Again, in the not infrequent occurrence of a case such as the following: a patient, generally of nervous temperament, on exposure to cold, or after fatigue or excitement, or even without any discoverable cause, feels sick, vomits perhaps, has a coated tongue, and in a few hours becomes jaundiced; the discoloration may affect the conjunctiva only, in other cases it may dye the skin of the whole body yellow; the stools are found to be pale or colourless even. The whole attack lasts, perhaps, three or four days, and is accompanied by great depression. The patient may undergo many such attacks, so frequently indeed, that before the discoloration of one attack has passed away, another may have begun. Here one-sixth or one-third of a grain of grey powder, taken at the very onset and repeated three or four times a day, will allay the sickness, cut short the illness, increase the intervals between the attacks, and after a time cure the patient, though he may have suffered thus for several years. If there is obstinate constipation, a course of Carlsbad waters will sometimes be found still more efficacious.

IV. In another serious form of diarrhœa common among children, the characteristics of which are the occurrence of very slimy stools, in typical cases mixed with blood, the passage of the stools being accompanied by pain and straining. Here the same weak bichloride solution mentioned under II., and administered in the same way, proves very efficient; the special indication for employing the bichloride is the slimy character of the motions. Sometimes the slime is very tenacious, and, being coloured with blood, is described by the mother as "lumps of flesh." This affection may be acute, or it may be chronic and last for months; in either case the bichloride cures with remarkable speed and certainty.

V. In the dysentery, acute or chronic, of adults, provided the stools are slimy and bloody. Here a similar treatment relieves, a hundredth of a grain of the bichloride given hourly, or every two hours, according to the severity of the case, being generally sufficient, and rarely fails to free the stools from blood and slime, though in some cases a diarrhœa of a different character may continue for a short time longer, and require perhaps other treatment to control it.

VI. In infantile cholera, characterized by incessant sickness, with profuse and almost continuous diarrhœa, of very offensive and copious motions, which are watery, almost colourless, or of a dirty muddy aspect. A sixth of a grain of grey powder given hourly is of great service here, and under this treatment the vomiting, as a rule, soon ceases, and shortly afterwards the diarrhœa also. Infantile cholera is an extremely fatal disease, running at times so rapid a course that in a very brief space a child is reduced to a death-like aspect and a condition of great danger. It is essential therefore to check the diarrhœa as speedily as possible. In urgent cases a starch injection, containing a minute quantity of laudanum, assists the action of the grey powder.

VII. In a chronic diarrhœa of infants, often seen, and characterized by watery, very offensive, muddy-looking or green-coloured stools, to the number maybe of ten or twelve daily. Here again a like treatment is indicated. This diarrhœa will generally yield to grey powder, in doses of a sixth of a grain, given at first hourly, and then every two or three hours, according to the frequency of the stools. Vomiting is an additional indication for this treatment. Although this drug may check the diarrhœa and vomiting, yet, if the disease has endured a long time, so serious may be the injury inflicted on the mucous membrane of the stomach, that food can neither be digested nor absorbed, and the child gradually wastes away. The appearance of thrush in the mouth is an unfavourable sign, as it generally indicates profound damage to the mucous membrane of the digestive canal. So also it is always a bad sign in the chronic diarrhœa of children when the stools change in character from time to time, being now watery, then slimy, at one time curdy, and at another time green. It is far easier to cure a diarrhœa, when the motions are of a uniform character. In most of these cases full doses of the nitrate of bismuth increase the curative action of the mercury.

It is important to treat the severe forms of infantile diarrhœa promptly, for being generally inflammatory, the mucous membrane soon becomes seriously affected; the lining membrane of the large gut may thus become extensively ulcerated or considerably thickened and in appearance granular-looking, whilst the mucous membrane of the small intestine, less commonly affected, may be much softened. It will be readily understood that disease so extensive must take some time to cure.

Mercury, as we have seen, proves very serviceable in most of the forms of infantile diarrhœa, both acute and chronic. I have endeavoured to point out categorically the circumstances under which one or other mercurial preparation is indicated. It might be urged that, as in both acute and chronic diarrhœa of severe type the same pathological conditions are found, the same form of mercury should be suitable for the one case and the other. But although the pathological state is held to be identical, still some hitherto undetected differences there must be, either in the nature of the disease itself, or of the part affected; for of a certainty it must require a different pathological condition to produce stools which are in one case slimy, in another watery, and in yet another green and curdy. These differences displayed in the symptoms, though at present not discriminated pathologically, require somewhat different treatment. Hence, though in each kind of diarrhœa all forms of mercury are useful, it is found that in some cases the bichloride of mercury is greatly to be preferred, and in other cases the grey powder. In the treatment of chronic diarrhœa, mercurial preparations are often required for many days in succession, and it frequently happens that, though they alter the character and lessen the frequency of the motions, yet the diarrhœa persists, and may require for its cure other remedies, such as lime, arsenic or nux vomica.

In the treatment of chronic, as well as of acute diarrhœa, too much attention cannot be paid both to the quality and quantity of the food. Acute diarrhœa is often aggravated, and made chronic, by over-feeding; thus, in cases, not infrequently arising in which a short time after each meal the child is violently purged, the mother seeing it waste rapidly is apt to think that she can sustain her child in no other way than by giving it as much food as possible. It should however be borne in mind that in a case of this kind digestion is greatly impaired, and that but little food is really digested; this being so, any excess will lodge in the intestinal canal, and undergoing decomposition, will act as an irritant, and increase the disease. Accordingly in these cases the total quantity of food should be small, but it should be given frequently in very small portions. In most forms of diarrhœa in children I am satisfied that it is wiser to cut off milk and substitute some artificial food such as Nestlé's, Savory and Moore's, or Mellin's, or we may give Robinson's prepared barley, etc. At times the substitution of scraped meat for all forms of starchy and milky food yields the best results.

There is a form of infantile diarrhœa, in which the child passes large, acid, offensive, curdy stools, evidently consisting of decomposing curds. Mercurial preparations, and, indeed, the other usual remedies for diarrhœa are often of little avail in this form; it is best treated by withholding milk entirely and substituting animal food as above mentioned or an artificial food of the kind just referred to.

In all cases of diarrhœa it is important that the child should be warmly clothed, and in particular that the abdomen be protected from chill; this is best done by putting a flannel roller round the abdomen.

The chronic diarrhœa of adults, independent of serious organic changes in the intestines, but marked by pale watery stools, often yields to the hundredth of a grain of corrosive sublimate every two or three hours. The same treatment answers sometimes in the diarrhœa of typhoid fever and of phthisis.

With one-third of a grain of grey powder, administered three or four times a day, the thickly-coated creamy tongue of certain cases of dyspepsia, occurring in the course of chronic disease, or in the early stages of convalescence from acute illness, will generally clean rapidly, and with it there will be a simultaneous improvement of the appetite and digestion, and the removal of the disagreeable taste in the mouth complained of. If constipation be present, then it is better to give half a grain of calomel with three grains of extract of hyoscyamus for three nights in succession. The first of these pills generally purges twice or thrice, the second less, and the third not at all. On the other hand, grey powder should be given if there is either diarrhœa or a tendency to it; for, besides its effect on the tongue and stomach, the powder will generally control the diarrhœa, at the same time restoring the natural colour to the motions, if too light or too dark.

Mercury is pre-eminently useful in syphilis. The following fairly represents, I believe, the views now most generally held :—

That it is beneficial in both primary and secondary syphilis;

That whilst it is of use in the treatment of the hard chancre, it does harm in the soft chancre;

That by the aid of mercury the hard chancre is more speedily cured, and at the same time the patient rendered less liable to secondary symptoms; if, however, these do occur, they are milder in character;

That most forms of secondary syphilis yield quickly to mercury;

That in the later or tertiary stage of syphilis the use of mercury may be advantageously conjoined with that of the iodides, or that this combination may be reserved for those cases which fail to react satisfactorily to the iodides.

The following propositions are extracted from the admirable lectures by Mr. Jonathan Hutchinson, to whom medical science is in so many ways indebted :—

"That mercury is probably a true vital antidote against the syphilitic virus, and that it is capable of bringing about a real cure.

"That in practice a good many cases are really cured by mercury, the cure being proved by the restoration to good health, and in some cases by renewed susceptibility to contagion.

"That the probability of cure depends upon the stage of development attained by the disease when the remedy is resorted to, and upon the perseverance with which it is used.

"That in order to secure the antidotal efficacy of mercury against syphilis, it is desirable to introduce a considerable quantity into the system, and to protract its use over a very long time.

"That ptyalism and other evidences of the physiological action of mercury, so far from being beneficial, are, if possible, to be carefully avoided, since they prevent the sufficiently prolonged use of the remedy.

"That in cases in which the patient shows an idiosyncrasy, being peculiarly susceptible to mercury, the indication is to reduce the dose, rather than to omit the drug.

"That it is impossible to begin the administration of mercury too soon, and that it should be resorted to, without loss of time, in all cases in which a chancre shows a tendency to indurate.

"That many cases of indurated chancre, treated early by mercury, never show any of the characteristic symptoms of the secondary stage.

"That in other cases of mercurial cure of the chancre, in which nevertheless secondary symptoms do occur, they are usually milder than if allowed to develop without specific treatment.

"That when mercury does not wholly abrogate the secondary stage, it exhibits a remarkable power in delaying it.

"That delayed outbreaks of secondary syphilis are to be regarded rather as proof that the administration had not been sufficiently persevering, than that the remedy was not efficient.

"That it is probable that the risk of tertiary symptoms is in direct ratio with the severity and prolonged duration of the secondary stage.

"That there are some grounds for believing that the tertiary symptoms of syphilis are both less frequent and less severe in those who have been efficiently treated by mercury, than in others.

"That mercury, cautiously given, does not, in a great majority of cases, do any injury to the general health, and that its local inconveniences may usually be prevented.

"That the doctrine of the real antidotal character of mercury in respect to syphilis ought to lead to much more prolonged administration of it, with the hope of destroying utterly all lingering germs of the malady.

"That most collected statistics as to the duration of treatment and freedom from relapse are misleading and worse than useless, because usually the treatment was far too short to be effectual.

"That it has not yet been proved that there are any special forms of syphilitic disease in which mercury ought to be avoided, although, as a rule, it is acknowledged that it must be used with more caution in all forms which are attended with ulceration than in others.

That iodide of potassium possesses little or no efficacy against either the [illegible] or secondary form of syphilis.

> "That the efficacy of mercury is often most signally proved in cases which have utterly resisted the action of iodide of potassium.
>
> "That it does not much matter whether the mercury is given by the mouth, by inunction, or by the vapour bath, provided that whatever method is selected, care is taken to avoid salivation, purging, etc.
>
> "That the doses usually resorted to for internal administration are for the most part too large, and thus often necessitate a premature discontinuance of the remedy.
>
> "That if one method of administration does not proceed satisfactorily, another should be tried; and that in no case of difficulty should the vapour bath be forgotten."

Many other writers agree with Mr. Hutchinson. Dr. Keyes, of New York, recommends the unremitting use of mercury for at least two years, and sometimes longer, in small doses incapable of producing physiological effects. Dr. Keyes entertains the belief that syphilis can be eradicated.

Most of the forms of congenital syphilis of children succumb to mercury with singular rapidity. It is a common practice to give to children small doses, such as a quarter of a grain of grey powder, and to add to it a small portion of Dover's powder to prevent relaxation of the bowels. But I am convinced that much larger doses of grey powder are more beneficial, and remove the disease far more quickly, and succeed, indeed, where the smaller dose fails. Thus one, or even two, grains of grey powder may be given three times a day, unguarded by opium, for it is the rarest thing for even these doses to purge; nay, if any diarrhœa exists—a not uncommon complication—these doses will often check it. Moreover, this treatment may be continued for a considerable time, till, indeed, every symptom has vanished, without producing any of the toxic effects of the drug. As a rule, however, one grain of grey powder, thrice daily, is sufficient. Those comparatively rare forms of congenital disease, in which the periosteum is affected (usually near the articulation of some of the long bones), yield best to iodide of potassium, though, as far as my experience goes, it is still necessary in most cases to resort to mercury to remove the other evidences of syphilis.

While admitting then the general validity of these views, it is necessary to say that, sometimes, syphilitic patients are apparently completely cured without mercury, by general treatment tending merely to improve the health; and, further, that if the health is kept in good order, the secondary symptoms are milder in character. Lastly, that cases of syphilis do occur which are entirely uninfluenced by mercury, and are curable only by diligent attention to those hygienic circumstances which mend the general health.

When other means fail, mercurial fumigations, with steam, often cure; it is thus with certain obstinate syphilitic rashes.

The firmest believers in the efficacy of mercury in syphilis are unanimously agreed that to give it in quantities sufficient to produce salivation, is not only undesirable, but pernicious, yet it appears that those preparations which salivate quickest manifest the greatest power over the disease, and hence the metallic and mercurous preparations, such as grey powder and calomel, are preferred by some to the mercuric salts, such as corrosive sublimate. The use of mercury should be persisted in for not less than a year from the time of infection.

Special attention to the mouth, in the way of cleanliness and the removal of any source of irritation, such as unsound teeth, etc., is important during a course of mercury. Fruit and fresh vegetables may excite diarrhœa, and, therefore, a little watchfulness is called for in their use.

It was formerly thought that mercury salts were endowed with the power of controlling inflammation, and to this end they were constantly given, even to salivation; now, however, their use under such circumstances is much less general. Bichloride of mercury, however, certainly does appear to be of great use in iritis and inflammations of the deep-seated parts of the eye; in other inflammations also, especially of the serous membranes, it is probably of service in checking the inflammation and in promoting the absorption of effused products.

According to very high authorities, among whom may be mentioned Dr. Parkes, small doses of calomel may be very beneficially given in typhoid fever. The drug should be given at the commencement of the attack; some think it useless after the ninth or tenth day. It is considered to lessen the height of the fever, to shorten its course, to render the intestinal derangement much milder, and to check the diarrhœa. Some push the medicine till the gums are slightly touched; but *this* practice, not only unnecessary, but harmful, should be carefully avoided. The use of calomel in typhoid fever is claimed by many on the ground of its antiseptic action; but the value of the antiseptic treatment of typhoid cannot be said to be established. (*See also under* Chlorine.)

Calomel administered several times a day has been strongly recommended as a powerful diuretic in cardiac dropsy, and, by some writers, also in renal dropsy. In combination with digitalis and squill, according to the formula—of each one grain, in pill form with extract of henbane—it is very effectual.

It has been recommended in cirrhotic ascites. Sometimes its effects are temporary only.

In a certain stage of tonsilitis the influence of mercury is most marked, owing, probably, to its absorption into the circulation. Thus in quinsy or scarlatina, when the enlarged tonsils almost meet and block the passage, and when the difficulty in swallowing is nearly insuperable, with danger even of suffocation, at such a crisis, a third of a grain of grey powder, taken every hour, will greatly reduce the swelling within a few hours, and obviate both the distress and the danger; even if an abscess should have formed, its maturation and evacuation appear to be effected more quickly.

The same powder, administered in the same dose three or four times daily, is useful in mumps, relieving speedily both the swelling and the pain. As in the last case, the drug acts, probably, only after its absorption.

To prevent or mitigate an attack of sick headache, it is a common and often successful practice to take a mercurial purge, generally in the form of a blue pill. For further suggestions as to the employment of mercury in this troublesome affection, the reader is referred to the section on Podophyllum.

We have already referred to the power of mercury preparations, as a class, to destroy the lower forms of life, and to the application of this fact in the treatment of parasites of the body and of certain parasitic moulds. The germicidal power of mercury salts has been established by numerous investigations and extensive experience. To Koch in particular, we are indebted for knowledge upon this subject. His researches have been confirmed amongst many others by Sternberg, and it is now firmly established that mercuric bichloride is a most powerful germicide. In regard to its power to destroy the micrococcus of pus, Sternberg thus ranks it relatively to other germicidal agents:—Mercuric bichloride 0·005%, potassium permanganate 0·12%, iodine 0·2%, creasote 0·5%, carbolic acid 1·0%, zinc chloride 2%.[1] This germicidal power has led to the use of weak mercuric bichloride solutions in antiseptic surgery (*see* surgical treatises for the various mercurial dressings) and as a topical application in diphtheria. A solution of 1 in 2,000 to 1 in 1,000 applied frequently may be used in diphtheria: some advise a strength of 1 in 500.

Potassio-mercuric iodide is a germicide four or five times more powerful than mercuric bichloride. It may be used in the strength of 1 part in 12,000 (Levis).

To disinfect stools, *e.g.* of typhoid fever, the excreta should receive not less than *an equal bulk* of a 1 per 1,000 solution. To disinfect sputa, *e.g.* in phthisis, carbolic acid is a better disinfectant (*see* Carbolic acid), probably because the mercury coagulates the albuminoids present. Albumen and sulphides interfere seriously with the efficiency of corrosive sublimate. Koch, therefore, directs that so much of the mercurial should be added to such fluids as to ensure the presence of at least 1 in 5,000 *after the formation of insoluble compounds, albuminates, sulphides, etc.* He says we may test this point by putting into the fluid, to be disinfected, bright strips of copper; if salts are to some extent eliminated by the kidneys, by the mbrane of the intestines, chiefly as sulphide, and by the 1e bile; indeed, it has been found in every secretion, al and pathological.

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[1] These percentage figures represent the percentage strengths of solutions adequate to destroy the above micrococcus of pus. For other organisms, figures almost equally striking show the very high germicidal power of corrosive sublimate. (*See* Brunton's tables, *Pharmacology and Therapeutics.*)

now proceed to consider the action of mercury compounds n important organs or systems, and the application of this 1e treatment of disease. The alimentary tract claims our rst.

ble preparations of mercury combine with the albuminous the mouth, and any portion left uncombined attacks the mbrane, and, if in quantity, may excite in it acute inflam- 'here will be a similar action in the stomach.

o therapeutic application: a form of vomiting is sometimes n very young children—generally only a few weeks old— lds in many instances to grey powder or calomel, but o grey powder. The chief, and to a great extent character- re of this vomiting is its suddenness and instantaneousness; y the milk is swallowed it is forcibly expelled, curdled or apparently without any retching or effort on the part of The milk literally shoots out of both mouth and nose. nay exist, but more generally there is constipation. This ten proves both obstinate and dangerous, all the food being ntil the child, reduced almost to a skeleton, dies actually of At the *post-mortem* it often happens, either that nothing) account for death, or that the mucous membrane is dis- be much softened, and like water arrowroot in consistency ance. One-third of a grain of grey powder, repeated every e hours, will, in many instances, quickly stay this vomiting, r resist all other remedies. A twelfth of a grain of calomel hours is sometimes equally successful.

limentary tract below the stomach the soluble preparations s purgatives, increasing the secretion from the mucous he bowel and enforcing the contractions of the muscular coat estines. Not all mercurial compounds, however, are em- purgatives, and, when purgation is needed, our choice falls lue pill, calomel, or grey powder; either of the two latter, eless, is a useful preparation for children.

rgatives act more efficiently when given in small doses, at ntervals, say, every hour, but this does not hold for calomel. ccording to my experience, do we much increase the purga- of calomel by augmenting the size of the dose; thus a grain s energetically as five grains. As an occasional purgative most valuable, but where a nightly purgative is needed it nswer, for the dose adequate to produce four or five motions ight may act only twice or three times the second, and often the third.

The special influence of mercury salts on the pancreatic and biliary secretions is still undecided. Seeing the influence of mercury on the salivary glands, some have conceived it probable that it exerts a similar influence upon the pancreas, a gland which in its structure and secretion is very similar to the salivary glands.

Most opposite statements have been made concerning the action of mercury on the secretion of bile. From experiments on animals it has been concluded, though not without dissent, that mercury in health diminishes the secretion of bile. In his report, as secretary of the Edinburgh committee appointed to investigate this matter, the late Dr. Hughes Bennett arrived at somewhat the same conclusion. This report states: (1) That neither blue pill, calomel, nor corrosive sublimate, affect the bile unless they purge, or impair the health, in which case the quantity of bile is diminished. (2) That during an attack of dysentery, both the solid and fluid constituents of the bile are diminished. (3) That purgation from any cause lessens the amount of bile and the proportion of its solid constituents. (See Podophyllum.)

Röhrig and Rutherford have re-investigated this subject, and they conclude that calomel does not increase the secretion of bile, nay, in purgative doses, that it may even decrease it. Rutherford finds, however, that the bichloride of mercury does increase the secretion of bile.

Dr. H. Bennett's committee experimented on dogs fed regularly. Rutherford and Röhrig, on fasting dogs; in every instance they first paralyzed the animal with curare. They inserted a glass cannula into the common bile duct near its junction with the duodenum, then compressed the gall bladder to fill the tube with bile, and clamped the cystic duct. They then closed the wound in the abdomen, and collected the bile as it flowed through the cannula.

In some experiments Rutherford placed the calomel in the duodenum unmixed with bile, in others mixed with it; in yet others he administered the calomel by the stomach.

In spite of these results the experience of generations supports strongly the conviction that in some diseases calomel (as well as other preparations of mercury) does increase the bile. Moreover, it is not difficult to conceive that in a given disease mercury may set aside some condition hindering the formation of bile, and thus act as a cholagogue, though possibly in health it may even check this secretion. It is certain that small doses of mercurial salts will restore colour to colourless stools; their efficacy to do so may be tested over and over again in children, among whom we often meet with cases in which for weeks quite colourless stools are passed. In such cases grey powder will restore the colour, and this result can be obtained many times in succession in the same patient, since it often happens that some time after the discontinuance of the mercury the colour again leaves the motions.

When given to promote the secretion of bile, the common practice to give a purgative dose for one or two nights, but if there is no onstipation there is no need to purge, and a small dose, say one-ixth to one-half grain of grey powder twice or three times a day, will be found to answer better. The administration of small doses requently is especially advantageous in cases where the illness is apt o recur from slight and scarcely preventible causes, and where the frequent employment of purgative doses would favour after-constipation, and produce depression and possibly salivation. For these last-named reasons it is common to hear highly practical doctors decry mercurial preparations, whereas were they to employ the minute doses now recommended they would obtain the desired effect and exclude the bad results they fear. Given in the doses just mentioned, mercurial preparations are signally useful in certain cases which I will now indicate.

I. A patient voids pale clayey stools and suffers from acidity, flatulence, or vomiting; the symptoms occurring sometimes only before breakfast. Half a grain of grey powder given three times a day will often restore the colour to the stools, and upon this the dyspeptic symptoms may at once cease.

II. In a form of diarrhœa common among children and presenting the following symptomatology: the child's health is bad; the digestion is imperfect, and is generally associated with annoying flatulent distension, and the passage of three or four pale, clayey, pasty, stinking motions during the day. A single grain of the bichloride dissolved in half a pint of water, and administered in teaspoonful dose each hour, or, still better, one-third of a grain of grey powder every hour or two hours, will in one or two days limit the number of the stools, and restore to them their natural bilious colour, even though they may have been clay-coloured for weeks.

III. Again, in the not infrequent occurrence of a case such as the following: a patient, generally of nervous temperament, on exposure to cold, or after fatigue or excitement, or even without any discoverable cause, feels sick, vomits perhaps, has a coated tongue, and in a few hours becomes jaundiced; the discoloration may affect the conjunctiva only, in other cases it may dye the skin of the whole body yellow; the stools are found to be pale or colourless even. The whole attack lasts, perhaps, three or four days, and is accompanied by great depression. The patient may undergo many such attacks, so frequently indeed, that before the discoloration of one attack has passed away, another may have begun. Here one-sixth or one-third of a grain of grey powder, taken at the very onset and repeated three or four times a day, will allay the sickness, cut short the illness, increase the intervals between the attacks, and after a time cure the patient, though he may have suffered thus for several years. If there is obstinate constipation, a course of Carlsbad waters will sometimes be found still more efficacious.

IV. In another serious form of diarrhœa common among children, the characteristics of which are the occurrence of very slimy stools, in typical cases mixed with blood, the passage of the stools being accompanied by pain and straining. Here the same weak bichloride solution mentioned under II., and administered in the same way, proves very efficient; the special indication for employing the bichloride is the slimy character of the motions. Sometimes the slime is very tenacious, and, being coloured with blood, is described by the mother as "lumps of flesh." This affection may be acute, or it may be chronic and last for months; in either case the bichloride cures with remarkable speed and certainty.

V. In the dysentery, acute or chronic, of adults, provided the stools are slimy and bloody. Here a similar treatment relieves, a hundredth of a grain of the bichloride given hourly, or every two hours, according to the severity of the case, being generally sufficient, and rarely fails to free the stools from blood and slime, though in some cases a diarrhœa of a different character may continue for a short time longer, and require perhaps other treatment to control it.

VI. In infantile cholera, characterized by incessant sickness, with profuse and almost continuous diarrhœa, of very offensive and copious motions, which are watery, almost colourless, or of a dirty muddy aspect. A sixth of a grain of grey powder given hourly is of great service here, and under this treatment the vomiting, as a rule, soon ceases, and shortly afterwards the diarrhœa also. Infantile cholera is an extremely fatal disease, running at times so rapid a course that in a very brief space a child is reduced to a death-like aspect and a condition of great danger. It is essential therefore to check the diarrhœa as speedily as possible. In urgent cases a starch injection, containing a minute quantity of laudanum, assists the action of the grey powder.

VII. In a chronic diarrhœa of infants, often seen, and characterized by watery, very offensive, muddy-looking or green-coloured stools, to the number maybe of ten or twelve daily. Here again a like treatment is indicated. This diarrhœa will generally yield to grey powder, in doses of a sixth of a grain, given at first hourly, and then every two or three hours, according to the frequency of the stools. Vomiting is an additional indication for this treatment. Although this drug may check the diarrhœa and vomiting, yet, if the disease has endured a long time, so serious may be the injury inflicted on the mucous membrane of the stomach, that food can neither be digested nor absorbed, and the child gradually wastes away. The appearance of thrush in the mouth is an unfavourable sign, as it generally indicates profound damage to the mucous membrane of the digestive canal. So also it is always a bad sign in the chronic diarrhœa of children when the stools change in character from time to time, being now watery, then slimy, at one time curdy, and at another time green. It is far easier to cure a diarrhœa, n the motions are of a uniform character. In most of these cases doses of the nitrate of bismuth increase the curative action of mercury.

is important to treat the severe forms of infantile diarrhœa nptly, for being generally inflammatory, the mucous membrane becomes seriously affected ; the lining membrane of the large gut thus become extensively ulcerated or considerably thickened in appearance granular-looking, whilst the mucous membrane he small intestine, less commonly affected, may be much softened. vill be readily understood that disease so extensive must take some e to cure.

ercury, as we have seen, proves very serviceable in most of the ns of infantile diarrhœa, both acute and chronic. I have en- voured to point out categorically the circumstances under which or other mercurial preparation is indicated. It might be urged , as in both acute and chronic diarrhœa of severe type the same ological conditions are found, the same form of mercury should be able for the one case and the other. But although the pathological e is held to be identical, still some hitherto undetected differences e must be, either in the nature of the disease itself, or of the part ted ; for of a certainty it must require a different pathological ition to produce stools which are in one case slimy, in another ery, and in yet another green and curdy. These differences dis- ed in the symptoms, though at present not discriminated patho- ally, require somewhat different treatment. Hence, though in kind of diarrhœa all forms of mercury are useful, it is found that me cases the bichloride of mercury is greatly to be preferred, and in r cases the grey powder. In the treatment of chronic diarrhœa, urial preparations are often required for many days in succession, it frequently happens that, though they alter the character and n the frequency of the motions, yet the diarrhœa persists, and require for its cure other remedies, such as lime, arsenic or vomica.

the treatment of chronic, as well as of acute diarrhœa, too h attention cannot be paid both to the quality and quantity of food. Acute diarrhœa is often aggravated, and made chronic, ver-feeding ; thus, in cases, not infrequently arising in which a t time after each meal the child is violently purged, the mother ng it waste rapidly is apt to think that she can sustain her child o other way than by giving it as much food as possible. It should ever be borne in mind that in a case of this kind digestion is greatly aired, and that but little food is really digested ; this being so, any ss will lodge in the intestinal canal, and undergoing decomposition, act as an irritant, and increase the disease. Accordingly in these s the total quantity of food should be small, but it should be given uently in very small portions. In most forms of diarrhœa in children I am satisfied that it is wiser to cut off milk and substitute some artificial food such as Nestlé's, Savory and Moore's, or Mellin's, or we may give Robinson's prepared barley, etc. At times the substitution of scraped meat for all forms of starchy and milky food yields the best results.

There is a form of infantile diarrhœa, in which the child passes large, acid, offensive, curdy stools, evidently consisting of decomposing curds. Mercurial preparations, and, indeed, the other usual remedies for diarrhœa are often of little avail in this form; it is best treated by withholding milk entirely and substituting animal food as above mentioned or an artificial food of the kind just referred to.

In all cases of diarrhœa it is important that the child should be warmly clothed, and in particular that the abdomen be protected from chill; this is best done by putting a flannel roller round the abdomen.

The chronic diarrhœa of adults, independent of serious organic changes in the intestines, but marked by pale watery stools, often yields to the hundredth of a grain of corrosive sublimate every two or three hours. The same treatment answers sometimes in the diarrhœa of typhoid fever and of phthisis.

With one-third of a grain of grey powder, administered three or four times a day, the thickly-coated creamy tongue of certain cases of dyspepsia, occurring in the course of chronic disease, or in the early stages of convalescence from acute illness, will generally clean rapidly, and with it there will be a simultaneous improvement of the appetite and digestion, and the removal of the disagreeable taste in the mouth complained of. If constipation be present, then it is better to give half a grain of calomel with three grains of extract of hyoscyamus for three nights in succession. The first of these pills generally purges twice or thrice, the second less, and the third not at all. On the other hand, grey powder should be given if there is either diarrhœa or a tendency to it; for, besides its effect on the tongue and stomach, the powder will generally control the diarrhœa, at the same time restoring the natural colour to the motions, if too light or too dark.

Mercury is pre-eminently useful in syphilis. The following fairly represents, I believe, the views now most generally held:—

That it is beneficial in both primary and secondary syphilis;

That whilst it is of use in the treatment of the hard chancre, it does harm in the soft chancre;

That by the aid of mercury the hard chancre is more speedily cured, and at the same time the patient rendered less liable to secondary symptoms; if, however, these do occur, they are milder in character;

That most forms of secondary syphilis yield quickly to mercury;

That in the later or tertiary stage of syphilis the use of mercury may be advantageously conjoined with that of the iodides, or that this combination may be reserved for those cases which fail to react satisfactorily to the iodides.

e following propositions are extracted from the admirable lectures r. Jonathan Hutchinson, to whom medical science is in so many s indebted :—

hat mercury is probably a true vital antidote against the syphilitic , and that it is capable of bringing about a real cure.

hat in practice a good many cases are really cured by mercury, the cure proved by the restoration to good health, and in some cases by renewed ptibility to contagion.

hat the probability of cure depends upon the stage of development ned by the disease when the remedy is resorted to, and upon the perse- nce with which it is used.

hat in order to secure the antidotal efficacy of mercury against syphilis, lesirable to introduce a considerable quantity into the system, and to act its use over a very long time.

hat ptyalism and other evidences of the physiological action of mercury, from being beneficial, are, if possible, to be carefully avoided, since prevent the sufficiently prolonged use of the remedy.

hat in cases in which the patient shows an idiosyncrasy, being pecu- susceptible to mercury, the indication is to reduce the dose, rather than it the drug.

hat it is impossible to begin the administration of mercury too soon, and it should be resorted to, without loss of time, in all cases in which a re shows a tendency to indurate.

hat many cases of indurated chancre, treated early by mercury, never any of the characteristic symptoms of the secondary stage.

hat in other cases of mercurial cure of the chancre, in which never- ss secondary symptoms do occur, they are usually milder than if ed to develop without specific treatment.

hat when mercury does not wholly abrogate the secondary stage, it its a remarkable power in delaying it.

hat delayed outbreaks of secondary syphilis are to be regarded rather of that the administration had not been sufficiently persevering, than the remedy was not efficient.

hat it is probable that the risk of tertiary symptoms is in direct ratio the severity and prolonged duration of the secondary stage.

hat there are some grounds for believing that the tertiary symptoms of lis are both less frequent and less severe in those who have been ntly treated by mercury, than in others.

hat mercury, cautiously given, does not, in a great majority of cases, do injury to the general health, and that its local inconveniences may lly be prevented.

hat the doctrine of the real antidotal character of mercury in respect to lis ought to lead to much more prolonged administration of it, with the of destroying utterly all lingering germs of the malady.

hat most collected statistics as to the duration of treatment and freedom relapse are misleading and worse than useless, because usually the ment was far too short to be effectual.

hat it has not yet been proved that there are any special forms of litic disease in which mercury ought to be avoided, although, as a rule, acknowledged that it must be used with more caution in all forms which ttended with ulceration than in others.

hat iodide of potassium possesses little or no efficacy against either the ary or secondary form of syphilis.

"That the efficacy of mercury is often most signally proved in cases which have utterly resisted the action of iodide of potassium.

"That it does not much matter whether the mercury is given by the mouth, by inunction, or by the vapour bath, provided that whatever method is selected, care is taken to avoid salivation, purging, etc.

"That the doses usually resorted to for internal administration are for the most part too large, and thus often necessitate a premature discontinuance of the remedy.

"That if one method of administration does not proceed satisfactorily, another should be tried; and that in no case of difficulty should the vapour bath be forgotten."

Many other writers agree with Mr. Hutchinson. Dr. Keyes, of New York, recommends the unremitting use of mercury for at least two years, and sometimes longer, in small doses incapable of producing physiological effects. Dr. Keyes entertains the belief that syphilis can be eradicated.

Most of the forms of congenital syphilis of children succumb to mercury with singular rapidity. It is a common practice to give to children small doses, such as a quarter of a grain of grey powder, and to add to it a small portion of Dover's powder to prevent relaxation of the bowels. But I am convinced that much larger doses of grey powder are more beneficial, and remove the disease far more quickly, and succeed, indeed, where the smaller dose fails. Thus one, or even two, grains of grey powder may be given three times a day, unguarded by opium, for it is the rarest thing for even these doses to purge; nay, if any diarrhœa exists—a not uncommon complication—these doses will often check it. Moreover, this treatment may be continued for a considerable time, till, indeed, every symptom has vanished, without producing any of the toxic effects of the drug. As a rule, however, one grain of grey powder, thrice daily, is sufficient. Those comparatively rare forms of congenital disease, in which the periosteum is affected (usually near the articulation of some of the long bones), yield best to iodide of potassium, though, as far as my experience goes, it is still necessary in most cases to resort to mercury to remove the other evidences of syphilis.

While admitting then the general validity of these views, it is necessary to say that, sometimes, syphilitic patients are apparently completely cured without mercury, by general treatment tending merely to improve the health; and, further, that if the health is kept in good order, the secondary symptoms are milder in character. Lastly, that cases of syphilis do occur which are entirely uninfluenced by mercury, and are curable only by diligent attention to those hygienic circumstances which mend the general health.

When other means fail, mercurial fumigations, with steam, often cure; it is thus with certain obstinate syphilitic rashes.

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[1] These percentage figures represent the percentage strengths of solutions adequate to destroy the above micrococcus of pus. For other organisms, figures almost equally striking show the very high germicidal power of corrosive sublimate. (*See* Brunton's tables, *Pharmacology and Therapeutics.*)

Mercury, both as calomel and as corrosive sublimate, has been employed in some affections for its disinfectant powers. Thus in typhoid fever it has been used, and in the septic blood state of malignant endocarditis. Broadbent recommends corrosive sublimate in typhoid "when the motions are specially offensive and accompanied by much gas, the abdomen being tumid and the temperature high." Under these conditions he says, "from half to one drachm of the solution of perchloride of mercury, with perhaps one or two grains of quinine, may be given every four hours for two or three days with excellent effects." He says further: "When the nervous system is evidently overwhelmed by poison, while the abdominal symptoms are slight, the local lesions may be disregarded, and two or three grains of calomel may be administered once or on two successive days." It cannot be said, however, that intestinal asepsis in typhoid fever has gained ground to any very marked extent. (*See also* Chlorine.)

In malignant (ulcerative) endocarditis, mercuric chloride has been given in full dose, *i.e.* as large as can be borne, and it is said with good effects in some cases.

PREPARATIONS OF COPPER

APPLIED to the unbroken skin, the soluble salts of copper produce no visible effect. They unite with the soluble albuminous substances on sores, forming an insoluble albuminate, which coats the surface, and, in an imperfect manner, may take the place of the lost cuticle. The thin pellicle thus formed protects the delicate structures from the air, and the substances floating in it, and so promotes the healing process. Like the salts of many other metals, these salts condense the structures and constringe the blood-vessels, and so lessen the supply of blood to the part; they may do so, even to the extent of arresting hæmorrhage from the small vessels. They act besides, however, according to their concentration, as irritants or stimulants, to the delicate tissues, producing sometimes slight inflammation, with some smarting.

To arrest bleeding, and as a stimulant to indolent sores, the sulphate is most employed, either in stick or solution, or as an ointment.

Indolent forms of impetigo, after resisting the more usual applications, will sometimes yield to sulphate of copper.

In tinea tarsi the solid sulphate may be rubbed, often with conspicuous advantage, along the edges of the eyelids, the eyelashes having been previously cut off closely, and the scabs carefully removed. Indeed, in every case where slight stimulation is required, this salt may be used. Milder in its action than nitrate of silver, it excites much less pain.

Solutions of the sulphate of copper are employed in gonorrhœa, gleet, and leucorrhœa.

The soluble salts combine in the mouth with the liquid albuminous substances of this cavity, and precipitate them more or less completely; but if used in quantity more than sufficient to do this, the mucous membrane itself will be attacked in a manner altogether similar to the abraded skin. These salts possess a metallic styptic taste. The sulphate in the solid form may be applied with advantage to the spots of psoriasis, simple or specific, which affect the tongue; also to indolent sores of the tongue. Painted in solution along the edges of the gums in ulcerative stomatitis, sulphate of copper generally heals quickly the ulcerated surfaces; however, on the whole, the use of dried alum is to be preferred.

A weak solution of sulphate of copper painted over the mucous membrane will remove the white curdy-looking coating of thrush, and prevent its renewal.

The soluble salts of copper behave in the stomach in the same manner as in the mouth, and if taken in large quantities, act as powerful irritant poisons.

These salts are emetic; the sulphate, being speedy, and very effectual, is not unfrequently prescribed. A good way to give this salt as a vomit is to administer it in small and frequently-repeated doses. It generally produces one copious ejection without producing much nausea or prostration, neither does it cause any attendant purging. It is supposed to exert an especial therapeutic action on the larynx, hence it is sometimes given in croup, and for a double reason therefore is used when it is necessary to expel any obstructive substances from the glottis by the mechanical efforts of vomiting.

Copper salts, like zinc salts, alum, mustard, common salt, warm water and bitter infusions, act topically on the stomach, and slightly also by a direct action on the vomiting centre, after absorption into the blood.

In moderate doses the salts are astringent to the mucous membrane of the intestines, and the sulphate, administered either by the mouth or by injection into the rectum, is often effectual in staying severe chronic or acute diarrhœa, whether or not depending upon serious organic disease.

Copper salts, taken for a considerable time in small quantities, are said to give rise to a condition not unlike that produced by lead, *i.e.* there may be colic, with alternating constipation and diarrhœa, and it is even said that paralysis of the upper extremities, undistinguishable from that of lead, may arise.

Salts of copper find their way into the blood, and exist there, probably, as albuminates.

Drs. Levi and Barduzzi find that small doses of sulphate of copper promote assimilation, and increase strength and "flesh" in man and animals. They are used with benefit in erythema, ecthyma, eczema, scrofula, and tuberculosis; their mode of action here would probably come under the head of alterative. Copper, therefore, appears to act physiologically and therapeutically much like arsenic, and, like it, should be taken with, or soon after, food.

Copper salts have been given in cholera and epilepsy.

Copper is eliminated both by the urine and fæces.

PREPARATIONS OF ZINC

THE members of this group are employed in various ways as external applications.

Even in dilute solutions chloride of zinc destroys the lower forms of life, and is thus disinfectant and antiseptic. It has been used to destroy the contagiousness of typhoid stools. A strong solution should be poured into the bed-pan before, or immediately after, an evacuation. Zinc chloride does not, however, come near corrosive sublimate in disinfecting power, and is greatly inferior to carbolic acid. Koch regards it as practically worthless as a disinfectant.

The common action of zinc salts is astringent and irritant, but on account of differences in degree of solubility, varying affinities for water, and perhaps for the tissues, the several members of this group manifest these properties in unequal degrees.

The chloride and iodide, owing to their high diffusion-power and great affinity for water, are the most energetic, yet even these remain almost inert when applied to the skin, unless the cuticle is first removed, then however they permeate the tissues, and destroy them to a considerable depth. The chloride produces at first a sensation of warmth, which increases to a burning pain, which may last seven or eight hours; by this time the tissues will have been destroyed, and a white eschar formed, which separates in from seven to twelve days. The chloride and iodide, as we have just said, have hitherto been regarded as the most energetic salts of this series; but recently Mr. John Marshall has shown by experiments that the nitrate penetrates even deeper than the chloride, destroying the tissues to a greater depth; according to the same authority, the nitrate possesses the further advantage of producing less pain than the chloride. These three preparations, but especially the chloride, are used as caustics to nævi, warts, condylomata, the skin affected with lupus, and to syphilitic ulcers.

A grain or two grains of chloride of zinc dissolved in a pint of water, and a little of this solution injected hourly during the day, is useful in gonorrhœa, if treated at its very beginning, removing the disease often in from twenty-four to forty-eight hours. Rest, if possible, should be observed during the treatment, but this is not indispensable. Should the frequent injection cause any pain in the testicles, they should be suspended, and frequently fomented with hot water; if, notwithstanding, the pain continues and the swelling increases, the injection must be employed less often.

A solution so weak as the one recommended is no better, it may be said, than simple water, but the fact is that simple water does not cure with anything like the same rapidity. Moreover, if some of this solution is taken into the mouth, and retained there a few seconds, it will produce a decided roughness of the mucous membrane; now, if the solution is strong enough to affect in this way the mucous membrane of the mouth, it will certainly influence, in at least an equal degree, the similar, but more sensitive, structure of the urethra.

The sulphate having a lower diffusion-power, its action is much more superficial. In common with the other soluble salts of zinc, it forms an insoluble compound with albumen, and by virtue of its astringency condenses the tissues, and contracts the blood-vessels. As a stimulant and astringent it lessens the secretions, and promotes a healthier growth in ill-conditioned, free-secreting sores or eruptions. It is much used in general and special surgery as a simple astringent wash. As an eye lotion it is used in the strength of one or two grains to the ounce of water, the weaker solution preferably. In common with the chloride it is used as an injection in gonorrhœa or gleet.

In chronic inflammations of the throat it may be used as a spray, five to ten grains to the ounce, or it may be brushed on in the same strength. In simple relaxed throat it may be used, frequently, as a gargle, in weaker solution.

Sulphate of zinc is sometimes added to alum injections in the treatment of leucorrhœa. If used alone, a convenient strength is three grains to the ounce.

The carbonate and oxide are insoluble, or but very slightly soluble, in the animal fluids, and as these compounds possess no affinity for water, their action on the tissues is very weak. They are, however, slightly astringent, and are useful on account of this property, in the form of ointment, or of powder. The ointment of the oxide is used as a mild stimulating application in eczema, intertrigo, and impetigo, when, inflammation having subsided, the raw surface is left in an indolent state, with very little disposition to heal. Both the oxide and the carbonate are used as dusting powders in these same affections, and are, perhaps, the best powders for this purpose; but, as a rule, greasy applications are preferable. Diluted with one or more parts of starch with or without the addition of a small proportion of boric acid (which see), it makes an excellent dusting powder or ointment. In excessive, and also in offensive, perspirations, Shoemaker speaks very highly of the following prescription: oleate of zinc three parts, starch four parts, used as a dusting powder. This powder may or may not be perfumed with thymol one five-hundredth part. (*See Extra Pharmacopœia.*)

The more soluble preparations of zinc possess a metallic styptic taste. None are employed in diseases of the mouth. [The chloride has been used to destroy the exposed painful pulp of decayed teeth.]

The carbonate in large doses produces some nausea and vomiting; but a full dose of the sulphate acts much more speedily, is a safe emetic, producing little prostration or nausea, and generally empties the stomach in one complete evacuation. It is, therefore, the best emetic in cases of poisoning, being far preferable to the slow and uncertain action of ipecacuanha. It may also be employed as an emetic in bronchitis or croup,—in bronchitis, to expel the mucus from the bronchial tubes, in croup, the false membrane from the larynx; for both of these purposes, however, other emetics are mostly preferred. In doses short of the induction of vomiting the sulphate may be employed, in painful affections of the stomach, dependent on chronic inflammation of the mucous membrane. Injected into the blood, the sulphate does excite vomiting; it acts, however, chiefly by a direct topical action on the stomach, *i.e.* it acts more powerfully when introduced into the stomach. The chloride being a corrosive poison is never used as an emetic.

On account of its slight solubility, the oxide exerts but slight action on the stomach, little being dissolved unless much acid is present in the stomach.

Like most other metallic preparations, the oxide and sulphate of zinc are useful in acute or chronic diarrhœa. Dr. Brackenridge recommends strongly the oxide of zinc, in two to four grain doses every three hours, in the diarrhœa of children. The direct astringent action of sulphate of zinc upon the intestine must take effect on the upper part of the canal, since the portion escaping absorption must be speedily converted into an inert sulphide.

The stomach may become habituated to the ingestion of very large doses of the sulphate, to the extent, even, of forty grains thrice daily, without obvious bad results, or at least without inducing either nausea or vomiting, or other discomfort. As it has been shown, however, that superficial ulceration of the stomach may be produced, the prolonged employment of such doses is imprudent.

Zinc colic has been described along with other symptoms, including constipation, vomiting, and prostration; a disagreeable taste in the mouth is often complained of.

Zinc finds its way into the blood, and exists there probably as an albuminate.

The oxide and sulphate have been employed with advantage in epilepsy and whooping-cough. In bromide of potassium we now possess a better remedy for epilepsy, but in certain cases rebellious to bromides, zinc salts are of value. Dr. Gowers considers the lactate and citrate of zinc the best preparations. They may be given, after meals, in doses "increased up to eight, ten or even fifteen grains twice or three times a day, without producing nausea."

Sulphate of zinc is often very useful in chorea. Like tartar-emetic, it succeeds best when given in doses sufficient to produce nausea, or even vomiting, and this daily; to effect this, however, the dose must be increased rapidly. It is astonishing how much of this drug can be borne, for I have given fifteen and sometimes twenty-two grains every two hours without producing nausea. Thus administered this salt often effects striking improvement, but these heroic doses may, after a time, excite pain at the pit of the stomach with loss of appetite; when this happens, another emetic, *e.g.* tartar-emetic, may be substituted with advantage. When given to excite nausea, it is a good plan to administer a dose before breakfast.

It is a noteworthy fact that most emetics are useful in chorea. Do they act by exciting the state of nausea, or is their beneficial operation a direct one upon the nervous centres, and the induction of nausea an unnecessary concomitant? Inasmuch as improvement occurs in many cases independently of the induction of nausea, the latter suggestion is the more probable.

Zinc salts are reputed to be powerful "nervine tonics," a somewhat vague expression, meant, I suppose, to imply that they promote the nutrition of the nervous system; some authorities attribute to this property the influence of these salts over chorea. In certain forms of hysteria zinc salts are useful, in particular the valerianate: this action also is described by many as "nervine tonic." (*See* Valerianates.)

Dr. Hammond recommends oxide of zinc, in two to five-grain doses, for nervous headache.

These substances are reputed to be antispasmodic. When they produce nausea, no doubt they indirectly act thus; but it is doubtful whether non-emetic doses are efficient antispasmodics.

The oxide, in two or four-grain dose, nightly, often controls profuse colliquative sweating: it is commonly combined with the extract of belladonna, gr. $\frac{1}{3}$–$\frac{1}{2}$, in pill-form. It is said also to check the profuse secretion from the bronchial mucous membrane in some forms of bronchitis.

This metal does not become fixed in the body, nor does it, like lead or mercury, produce a chronic affection. Zinc salts are eliminated from the body less rapidly than some other metals; they pass out in small quantities only, by the urine, the bowel being the chief eliminator. It has been asserted that very little of the salts pass into the blood; this may be true, but the fact that the chief part may be re-obtained from the fæces is no proof of this statement, since zinc, like many other metals, is probably excreted by the mucous membrane of the intestines, and by the liver.

PREPARATIONS OF ANTIMONY

TARTAR-EMETIC, in the form of ointment, excites in the skin a characteristic inflammation, at first papular, then vesicular, and lastly pustular. The rash thus runs the course of the eruption of small-pox, and in each stage may simulate it very closely, though there are points of difference distinguishable to a practised eye. Like the smallpox eruption, this rash often scars, and the capricious and painful action of the ointment renders it in general an unsuitable external application. Years ago tartar-emetic ointment used to be employed as a counter-irritant to obtain a powerful persistent action, for instance, in tubercular meningitis it was thus applied to the scalp; it is now rarely used for this purpose.

Chloride of antimony is a powerful escharotic, but it produces an ill-conditioned, slow-healing sore.

Tartar-emetic being the most used member of this group, our remarks, except when the contrary is stated, will apply to this compound.

After small medicinal doses the stomach experiences a slight sensation of soreness—a sensation easily mistaken for hunger. Pushed yet further, the drug produces increased secretion of mucus from the stomach and intestines, to the extent of inducing numerous moist motions; diarrhœa with colic may set in. The bronchial mucous membrane also yields an increased secretion, and, probably, the secretions of the mucous tracts generally are augmented. (Antimony is never used as a purgative; in fact, opium is frequently given in combination with tartar-emetic, expressly to prevent purgation.) Larger doses excite nausea and vomiting. As an emetic, tartarized antimony produces considerable depression, with a much greater degree of nausea than is the case with other emetics; the repeated vomiting is accompanied by great straining.[1] Its emetic action is somewhat tardy, sometimes twenty minutes to half an hour elapsing, hence in cases of poisoning it is unsuitable.

Majendie has shown that, when injected into the veins, tartar-emetic excites nausea, even after the removal of the stomach and its substitution by a pig's bladder; hence it has been generally held that this salt produces vomiting, not by its effects on the stomach, but on the nervous centres. Grimm finds that, when injected into a vein, it excites vomiting more slowly, and that a larger dose is required than when administered by the stomach, whence he concludes that tartar-emetic produces vomiting largely, though not wholly, by its effects on the terminations of the nerves of the stomach. He disposes of the difficulty raised against this view by Majendie's experiment, by assuming that tartar-emetic excites nausea by its effects upon the termination of the nerves of the œsophagus and intestines; the drug gaining access to these parts, after its injection into the blood, by an excretory action. Other observers explain the foregoing facts upon the supposition that tartar-emetic acts both on the terminations of the nerves of the stomach and also, directly, on the centre for vomiting: this is the view generally accepted.

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[1] Tartar-emetic was formerly employed to induce muscular weakness and relaxation of spasm, in order to facilitate the reduction of dislocations and of herniæ; but in such cases chloroform and ether have now completely superseded it.

Trousseau taught that food influences greatly the action of antimony, a low diet favouring the production of its constitutional effects, and a full diet its emetic and purgative effects. Its action is further modified by the quantity of water administered with it, for if this is small, vomiting takes place, if large, diarrhœa. Trousseau further observes that certain substances modify the effects of antimony; thus, wine and acid fruits, both fresh and preserved, develop its emetic and purgative properties.

The soluble antimony compounds enter the blood easily, but the form they assume there is unknown. Possibly, the oxide of the metal, either in the stomach, intestines or blood, combines with albumen, forming an albuminate. Antimony compounds, however, do not, it is said, combine with albumen, except in acid solutions, and then, only, to form an insoluble compound. The mode of entry is therefore not known.

In acute poisoning by tartar-emetic violent and continuous vomiting occurs, accompanied by a diarrhœa of bilious and bloody stools; sometimes the symptoms of gastro-enteritis, sometimes those of peritonitis, are present. The prostration is intense, and profound, and repeated faintings take place. The respirations and the pulse are said to be reduced both in frequency and in strength; others assert that the pulse is more frequent.

The post-mortem appearances are, inflammation of the stomach and intestines, but not often of the gullet; according to Harley, the rectum is often inflamed. The peritoneum may also be inflamed, and some inflammation of the lungs is usually observable, sufficiently frequently, indeed, to make it probable that tartar-emetic exerts an especial action on these organs.

In the treatment of poisoning by tartar-emetic the vomiting should be promoted by warm demulcent drinks, and strong tea or coffee, tannin, or decoction of oak bark should be diligently administered. Stimulants may be required to meet the depression.

In antimonial poisoning there is great motor and sensory paralysis, and loss of reflex action. The loss of reflex action and of motor power is due, Radziejewski shows, to the effect of the tartar-emetic on the cord. This salt also affects powerfully the heart of the frog, slowing and then arresting it in diastole; the heart of warm-blooded animals is affected in the same way, and simultaneously the arterial pressure falls greatly. At this stage, while the pulse may be slow and the diastolic pauses long, each individual beat may influence the mercurial column of the cardiometer five times more than normal, *i.e.* the oscillation becomes much more marked. After a large dose the pulse becomes at last very frequent and feeble, and the heart stops in diastole. After it has entered the circulation, tartar-emetic affects the heart by direct contact; this may be seen when the heart is removed from the body, the drug being directly applied to it. Radziejewski has shown that the ends of the vagi are paralyzed, and Ackermann that the contractility of the cardiac muscle is destroyed.

In the *Journal of Physiology*, I have published, in conjunction with Dr. Murrell, some experiments showing that tartar-emetic, like potassium salts, arsenious acid, aconitia and hydrocyanic acid, is a protoplasmic poison which destroys the functions of all the organs of the body in the order of their vital endowments. We have shown that the general paralysis which ensues in a frog after the hypodermic injection of tartar-emetic is due to the action of the drug on the spinal cord, thus confirming previous experimenters; and further that tartar-emetic is also a direct paralyser of the motor nerves, and of the muscles. Our experiments confirm the conclusions of previous observers concerning the action of tartar-emetic on the muscular substance of the heart.

We have thus shown that tartar-emetic paralyses the central nervous system, the motor nerves, the muscles, and the sensory nerves, and we are therefore led to infer that tartar-emetic is a protoplasmic poison, destroying the function of all nitrogenous tissues. Our experiments, however, fail to show whether it manifests for all the nitrogenous tissues an equal affinity, or whether it has a special action on some.

As in the case of potash salts, arsenious acid and aconitia, we suggest that tartar-emetic [illegible] its action on all the cardiac tissues, ganglia, nerves and muscular substance, affecting first the ganglia, then the nerves and then the muscular substance.

Tartar-emetic is a general as well as a cardiac depressant. The general depression is usually attributed to the action of the drug on the heart, but [illegible] would suggest that its depressing action [illegible] the central nervous system [illegible].

Antimony will be found [illegible]

person, if one experiment may be accepted as sufficient to settle the point. To a strong young man I gave tartar-emetic in half-grain dose every ten minutes for nearly seven hours, inducing great nausea and vomiting, with profuse perspiration; but during the whole time his temperature remained remarkably constant, varying not more than 0·4 Fah., an amount of deviation quite within the limits of health.

In our experiments Dr. Murrell and I noticed a peculiar effect of tartar-emetic on the skin. In a few hours the cuticle of a poisoned frog became softened and gelatiniform, too soft to be stripped off, though it could be easily scraped off every part of the body. Even small doses will soon produce this remarkable effect, for in one experiment the skin, after a small dose, became in this condition even whilst the animal could still crawl pretty well.

Miss Nunn, under the direction of Dr. Michael Foster, has carefully worked out the effect of tartar-emetic on the skin, and the results are published in the *Journal of Physiology* for 1878; to her investigation I shall refer in the article on Arsenic. Malcolm Morris praises highly tartar-emetic in $\frac{1}{32}$ grain dose in acute eczema. It is less successful in the chronic forms.

Like arsenic and phosphorus, tartar-emetic destroys the glycogenic function of the liver, and induces fatty degeneration of this and other organs. It splits up nitrogenous material into fat and some compound wherefrom leucin, tyrosin, and urea are formed, so that in cases of antimony poisoning there is increased formation of urea in the urine, and increased elimination of carbonic acid in the expired air. Tartar-emetic also increases both the insensible perspiration and the vapour from the lungs, but chiefly the former.

The statements concerning the influence of antimony on the urine are conflicting. The probable effect of tartar-emetic on this excretion is to lessen the amount of water and of chloride of sodium, owing to the increased perspiration. The urea is greatly increased, apparently in proportion to the dose of the antimony; the pigment and uric acid are also increased, but in a less degree.

Antimony is separated chiefly by the kidneys; some, however, passes with the bile, and some by the stomach and intestines. A portion is retained in the body.

Tartar-emetic acts, in many respects, like aconite; given in $\frac{1}{30}$ to $\frac{1}{12}$ grain dose, each hour, to a fever patient, it produces copious perspirations, and slows the pulse: upon this, restlessness, etc., disappear. In $\frac{1}{30}$ grain dose it often excites troublesome sickness, even in adults, and it is better therefore to begin with a $\frac{1}{60}$ to $\frac{1}{50}$ grain. In my experience, aconite, tartar-emetic, and carbonate of ammonia are the most powerful diaphoretics in fever; next to them, though a long way behind, comes acetate of ammonia.

Tartar-emetic is highly useful in catarrh of any part of the respiry tract, *e.g.* attacks of feverish cold, bronchitis, etc. A dose of of a grain, hourly, induces perspiration and secretion from the ous membrane, and cuts short the attack. Small hourly doses are erable to larger doses at longer intervals, for larger doses may te nausea and even vomiting with much depression. Being taste-, this is an excellent treatment for children, and the drug may be e quite palatable by the addition of syrup of orange peel to the ture. The addition of a small dose of potassium iodide, such as -sixth of a grain to each dose, heightens the effect.

ntimony is serviceable in chronic bronchitis, when the expectora-n is copious, frothy, and difficult to expel.

n the following disease tartar-emetic is invaluable :—

A child six to twelve years old is attacked, on the slightest expo-e to cold, with much wheezing and some difficulty of breathing, netimes so urgent as to compel him to sit all night propped up with lows. The expectoration may be fairly abundant, but is not mea-able, because a child of this age does not generally expectorate. listening to the chest there is heard much sonorous and sibilant, th perhaps a little bubbling, rhonchus, but this last is often absent. e wheezing may be audible for a considerable distance, and some-nes the noise is so great as to be heard many rooms off. Occasion-y the cough is troublesome, and on each exposure to cold the ice may become hoarse, and the cough hollow and barking. Some ildren become thus afflicted whenever the weather is cold, even in mmer, and they may not be free the whole winter; in the case of hers the attack may last only a few weeks or days. This affection metimes follows measles. It is compared by the mother to asthma, which it is certainly allied, if it be not identical with it.

In such a case the best way to administer this salt is to dissolve a ain of it in half a pint of water, and to give a teaspoonful of the lution every quarter of an hour for the first hour, afterwards hourly. the wheezing comes on at night, it is sufficient to give the medicine this time only. The good effects of the medicine become speedily ident, for on the very first night it often benefits the child greatly. small a dose, it may be thought, must be inefficacious, but when rst given it often produces vomiting once or twice in the day, thus roving its activity; as it is not necessary to produce sickness, the ose in this case must be made still smaller.

There is an affection, *unaffected by tartar-emetic*, which is omewhat similar to that just described, and which it is therefore ecessary to differentiate from it. It occurs in children a few months ld, and consists of a loud rattling, which is obviously caused by ucus in the throat or larynx. In some cases the rattling is worse in he day, but usually it is worse at night. There is no bronchitis, or there is, this is a mere coincidence; nay, sometimes on the occur-ence of bronchitis the complaint in question will cease for a time. It is brought on and aggravated by cold, and may last, with some fluctuations, many months.

Antimony in small doses hourly is very useful in the acute pulmonary catarrh of children, which is sometimes accompanied by vomiting and diarrhœa, probably due to catarrh of the intestines. The intestinal canal is sometimes the first attacked, but more frequently the lungs are first implicated. The tartar-emetic generally stays quickly the vomiting and diarrhœa, but it often takes a longer time to control the bronchitis.

Antimony, in large dose, was formerly much used in acute pneumonia, and in some cases small doses hourly certainly do seem very useful, when administered at the onset of the disease.

Administered in frequent small doses, antimony is serviceable in tonsilitis, pleurisy, puerperal peritonitis, inflammation of the breast, orchitis, whitlow, and other inflammatory affections.

Many cases of ague are curable by the impression emetics make on the system. An emetic administered each morning will help the action of quinine, and cases rebellious to quinine alone often yield immediately to the joint action of quinine and emetics. Ipecacuanha and other emetics should, however, be preferred to antimony.

Graves employed antimony in typhus and other fevers when there was much excitement and furious delirium, symptoms which are generally subdued by the exhibition of this drug. Since wakefulness is a concomitant symptom, being, indeed, the cause of the excitement and delirium, opium should be added to the antimony. The combined influence of these remedies calms the excitement, and induces refreshing sleep, from which the patient awakes refreshed and free from delusions. Judiciously employed, these remedies may save an almost hopeless life. Each drug appears to assist the action of the other; the relative doses must be determined by the circumstances of the case, thus, in furious delirium the tartar-emetic must be given in full, and the opium in small, quantities, while if wakefulness predominates, with not very boisterous delirium, the dose of tartar-emetic should be reduced, and the opium increased. Graves advises one-fourth to one-half a grain of the salt every hour or two hours, to be discontinued upon the occurrence of bilious stools. This treatment is very useful in the delirium which usually sets in about the ninth or tenth day of typhus.

The mania and sleeplessness of delirium tremens generally give way to the same treatment.

Puerperal mania may be treated in the same way, although probably bromide of potassium and chloral give better results.

Tartar-emetic, given to the extent of producing nausea and vomiting, once or twice a day, is sometimes useful in chorea. (*See* Sulphate of Zinc.) Increasing doses must be given, as the system soon appears to tolerate it. Other remedies, however, are more efficient.

In strumous ophthalmia tartar-emetic may be given with advantage, in doses of 1–36th to 1–48th of a grain three or four times a day. Sharp purgation at the commencement of the treatment is highly useful.

PREPARATIONS OF ARSENIC

ARSENIOUS acid is poisonous to many of the lower forms of animal life, but it does not impair the action of formed ferments, such as pepsine, pancreatine, etc.

Dry arsenious acid produces no changes in the unbroken skin, but in wounds or sores it excites very active inflammation, with much pain; the inflammation is sufficient, if the application is a strong one, to destroy the tissues for some depth. Arsenious acid has long been used to destroy warts, condylomata, cancerous growths, the nerve of a carious tooth, etc.

This caustic action, however, is different from that exerted by such agents as the strong mineral acids and the caustic alkalies: these will destroy the tissues equally whether the application is made to the dead or to the living body. Not so arsenic; its action as a caustic seems to depend on contact with the living tissues, and in part it will be the result of the violent inflammation which it excites; applied to the dead tissues on the other hand, it would seem rather to preserve than to corrode. What, if any, chemical combinations arsenic may enter into with proteids is at present unknown.

For caustic purposes arsenic may be applied pure, or mixed in variable quantities with some bland powder, such as starch. At times this application has enjoyed a high reputation, whilst at other times it has fallen into almost complete disuse. Some have fallen victims to this treatment, it is said, through the absorption of arsenic in sufficient quantity to destroy life, but an untoward result like this can occur only when certain well-known precautions are disregarded. Absorption can be effectually prevented if sufficient arsenic is employed to excite active inflammation, for inflamed tissue loses the power of absorption more or less completely. Produce active inflammation, and the patient is safe; but if, through fear of poisoning, too little arsenic is used, we shall in the most efficacious way do that which it is desired to avoid. Surgeons experienced in the employment of arsenic recommend that, if the tissues to be destroyed are extensive, the arsenic should be applied to a part only of the surface at a time. When employed to remove large growths, like cancer, the skin being unbroken, incisions are first made, and into these the arsenical paste is inserted; this soon stirs up active and deep-seated inflammation, and the growth dies for a considerable depth. The whole tumour often sloughs away from the healthy tissues—is in fact enucleated—leaving a clean and healthy sore, which heals without trouble in fifteen to thirty days.

Lupus and other obstinate skin affections may be treated in the same way.

Arsenious acid and powdered gum acacia, of each an ounce, blended with five fluid drachms of water, form an arsenical mucilage much used by Dr. Marsden to remove epitheliomatous growths. Some of this arsenical mucilage is to be painted over the tumour night and morning, great care being taken to limit its employment to the diseased tissues. Each application, covering not more than a square inch, is to be repeated several times, and the separation of the sloughs aided by poulticing.

If used in the form of powder, say with starch, the arsenic should constitute one-fifth or one-sixth part, so as to insure the excitation of sufficient inflammation to prevent poisonous absorption. This powder may also be used cautiously as a depilatory.

The liquor arsenicalis painted over warts is said to cause them to disappear, and a limited experience leads me to believe that the arsenic does disintegrate the wart, so that pieces of it drop off, or can be picked out. If very large, the wart must first be partially dissolved with liquor potassæ, so as to allow the liquor arsenicalis to come in contact with the softer tissues below. It has appeared to me also to be a useful application to corns. The corn should be well pared down and the liquor arsenicalis applied thrice daily. Under this treatment I have seen great improvement even in hard corns on the sole of the foot. Incidentally it may be mentioned that salicylic acid is a very useful application to corns.

An arsenical bath is useful in some forms of rheumatoid arthritis. It is made by adding to the water of an ordinary general bath four ounces of common washing soda and twenty grains of arseniate of soda.

Arsenic has a sweetish taste. In moderate doses it apparently neither undergoes nor produces any changes in the mouth. Dentists employ it as an escharotic to destroy the exposed sensitive pulp of a decayed tooth, or to destroy the pulp before stopping the tooth. If used to quell pain, the arsenic may be mixed with opium; it sometimes aggravates the pain at first.

The changes which arsenical compounds undergo in the stomach are at present unknown. There is no proof, as has been stated, that, like most other metals, arsenic combines with albumen to form an albuminate. The uniformity of action of all soluble arsenical compounds renders it probable that either in the stomach or the blood, they ultimately become identical in composition. Even the kakodyle compounds in which arsenic is in organic combination with carbon, and which, whilst intact, do not show the poisonous action of arsenic, these same compounds undergo a gradual decomposition in the body, and ultimately produce arsenical effects (Schmiedeberg).

Metallic arsenic, like the oxide, is poisonous; it is probably first oxidized before it becomes active. The pure sulphide of the metal is inert, but, as it generally contains a not inconsiderable quantity of the oxide, this admixture renders it poisonous. This applies both to the disulphide (Realgar) and the trisulphide (Orpiment).

The condition of the stomach is said to control the absorption route of arsenic; for example, when food is present, the medicine becomes absorbed by the lacteals, and through them becomes mixed with the blood, while if the stomach is empty the arsenic enters by the veins, and, passing directly to the liver, is separated with the bile.

In small medicinal doses, arsenic excites a sensation of warmth at the epigastrium, and gives rise to a sensation of hunger; indeed, many maintain that arsenic, while increasing appetite, promotes the digestion; this others as strenuously deny. Arsenic, as we shall see hereafter, by removing or lessening a morbid condition of the stomach, may promote both digestion and appetite.

In certain diseases of the stomach few remedies are more useful than arsenic. In the so-called irritative dyspepsia, where the tongue is furred, and its papillæ red and prominent, a drop of the solution of arsenic, taken shortly before food, will be found of great benefit. Administered in the same manner, it will arrest the distressing vomiting of drunkards with almost unfailing certainty, and simultaneously will improve the state of the stomach, and restore both appetite and digestion. This alcoholic vomiting, accompanied by great straining and distress, occurs usually in the morning before breakfast, and for the most part very little, sometimes nothing, is ejected; in the latter case it is called dry vomiting. The vomit, when present, is generally intensely bitter, sour, and of a green colour.

Arsenic is valuable in chronic ulcer and cancer of the stomach, allaying the pain and checking the vomiting, and I have seen this metal give relief in chronic ulcer, after the failure of the commonly-used remedies.

Arsenic sometimes removes heartburn, and other distressing sensations of the stomach, and is very useful in gastralgia. It is probable that some of the cases reported to be cured by arsenic, and supposed to be cases of ulcer of the stomach, were really cases of gastralgia.

Small doses of arsenic are serviceable in that form of chronic vomiting, in which, after eating, the patient may reject his meal without pain, and with scarcely any nausea, the food simply regurgitating into the mouth.

It has been recommended in the vomiting of cholera. It is often useful in the vomiting of pregnancy.

Dr. Simpson employed arsenic in that peculiar affection of the bowels prevalent among women, characterised by the copious discharge of membranous shreds, accompanied by much emaciation, and a long train of neuralgic and other nervous symptoms—an affection occasionally co-existing with dysmenorrhœa, the membranous shreds being discharged both from the bowel and from the uterus.

The solution of arsenic is always of service in that form of chronic dyspepsia and diarrhœa characterised by the following symptoms:—A sinking at the pit of the stomach, which is relieved by food, but immediately on taking it, nay, even during mastication, an urgent desire seizes the patient to relieve the bowels, and this may constrain him to quit the table. The motions are solid, or semi-solid, and usually contain lumps of half-digested food. The disease appears to depend on an excessive peristaltic action of the stomach and intestines whereby the food, before it is digested, is driven from the stomach into the intestines and thence expelled. This form of diarrhœa is common in children of eight or twelve years of age, and it may last many months. Arsenic in a few days will prolong the interval between the meal and the evacuation, and in a week or ten days the disease will give way. I always give one or two drops shortly *before* each meal. (*See* Opium.) Arsenic often proves useful in other chronic forms of diarrhœa, even when due to serious organic disease, such as the bowel ulceration of phthisis, etc.

Arsenic has been strongly recommended in cholera, especially in the later stages, when there is much collapse.

We may here make mention of a condition, seen chiefly in children but occasionally also in adults, in which a circular rash appears on the tongue; this, beginning at one or other point, enlarges, and forms separate rings which may coalesce. Sometimes the edges are not raised, and the patch looks as if due, merely, to a separation of epithelium, which leaves the surface unduly clean and smooth; in other cases the edges are raised, and they have a gelatinous aspect. This affection is often very obstinate, and of frequent recurrence, it is generally connected with stomach or intestinal disturbance; some cases are always associated with diarrhœa. Other cases are associated with a rash over the body, like lichen urticatus. In this affection of the tongue arsenic has appeared to me to be useful.

Arsenic enters the blood freely, but the effects of this drug on it are unknown. It has been detected not only in this fluid, but in most of the organs of the body. Though more quickly eliminated than some metals, such as lead, it is retained a long time in the body. Some have maintained that arsenic is to be found in the bones as arsenia of lime, a statement denied by others. It may be detected in the milk, and has induced serious symptoms in infants during suckling.

It is found in the blood associated chiefly with the red corpuscles. It is separated from the body by the kidneys, the stomach, and intestines, and perhaps by the liver, in the bile. After arsenical poisoning, the metal is found in the liver in quantities larger than elsewhere.

We know nothing of its influence on the composition of the urine. Some experimenters assert that the urea is lessened, and, inasmuch as the carbonic acid separated by the lungs is diminished, they conclude that arsenic diminishes tissue metamorphosis. Vogel observed hæmato-globulin in the urine of an individual poisoned by arseniuretted hydrogen.

The fact of its absorption and circulation is made very manifest by the symptoms which it produces.

In frogs, according to Sklarek, in about five minutes after poisoning by arsenic acid, the animal lies flat, with extended extremities and without breathing. Pinching, or other irritation, excites neither reflex action nor voluntary motion, though much voluntary power remains, since, on lifting the animal, or withdrawing a leg, or turning the frog on to its back, it displays active voluntary movements. In a short time, however, the animal becomes completely paralyzed. Arsenic, therefore, abolishes first sensation and reflex action, and sometime afterwards voluntary power. This account of Sklarek's corresponds with my own observation of the order in which the symptoms occur after poisoning by potash, or after mechanical arrest of the circulation in frogs during the summer months. My experiments with arsenious acid, dissolved by the aid of a small quantity of soda, made upon frogs during the month of October, do not agree with Sklarek's account, for I found that sensation and reflex action persisted as long, or longer, than voluntary power.

Sklarek attributes the general paralysis to the action of arsenious acid on the cord. My own experiments, conducted with Dr. Murrell, confirm this statement, but they show also that arsenious acid is a paralyzer of the motor and sensory nerves, and of the muscles, that, in fact, like potash, tartar-emetic and aconitia, it is a protoplasmic poison, destroying the functional activity, first of the central nervous system, next of the nerves, and lastly of the muscles.

Arsenious acid arrests the heart quickly in cats and frogs, and probably in other animals when administered in large doses. This effect is due to the direct action upon the heart, for arsenious acid arrests the frog's heart when removed from the body. As arsenious acid is a protoplasmic poison, I suggest that it stops the heart by affecting all its structures, its ganglia, its nerves, and its muscle. Arsenious acid lowers arterial tension; partly, it is thought, by its influence on the vaso-motor nerves, partly by its action on the heart. Böhm and Unterberger find that arsenic reduces especially the arterial pressure in the abdominal vessels.

Lesser concludes from his experiments on warm-blooded animals that paralysis of the heart is preceded by a slight and transient increase of irritability, with acceleration of the heart's beats. Large doses, however, decrease at once the heart's action, and the blood-pressure in the aorta falls immediately. He attributes the increased frequency of the pulse to depression of the vagi and stimulation of the cardiac ganglia. The depression from large doses he ascribes to depression of the cardiac ganglia and stimulation of the vagi. The vagi, he believes, are first stimulated and then depressed. Arsenic, he finds, does not affect either the accelerator nerves, or the vaso-motor centre, or the vaso-motor nerves, or the muscular fibres of the vessels.

Arsenic first stimulates, but in larger dose soon extinguishes the irritability of the respiratory centre. The primary stimulation is never great. Small doses stimulate the terminations of the pulmonary vagi.

Arsenic increases the peristalsis of the intestines by a direct action on the ganglia in the intestinal walls.

Lesser finds also that arsenic diminishes the irritability of the motor nerves and muscles, and that it first stimulates and then paralyzes the spinal cord. His experiments, then, for the most part confirm my conclusions that arsenic is a protoplasmic poison; but in addition he finds that there is at first a slight and transient stimulation of many structures.

Dr. Murrell and I noticed that in ten to twenty minutes after injecting a small quantity of arsenic under the skin of the frog the animal gapes, keeps its mouth open, and sometimes puts its paws into its mouth; it looks as if sick, and some frogs actually vomit. Arsenic, therefore, acts as an emetic on frogs.

Dr. Murrell and I were astonished to find how very fatal arsenious acid is to frogs, for $\frac{1}{30000}$ part of the weight of the animal produced complete paralysis in 108 minutes, and the same dose killed the frog on the third day. We found that frogs are much more influenced by arsenious acid dissolved in a small quantity of soda than by arseniate of soda; one-fifth of a grain of arseniate of soda requires eleven hours to produce complete paralysis.[1]

Some animals, such as the horse and sheep, can take considerable quantities of arsenic, not only without harm, but with apparent benefit.

The statements as to the effects of arsenic when taken for a prolonged period are strangely conflicting, yet all are probably true, though at present it is impossible to reconcile the discrepancies.

It is now established beyond reasonable doubt, that in some parts of Lower Austria, *e.g.* Styria, many of the inhabitants are accustomed to take considerable quantities of arsenic, sometimes as a condiment, with their food. It is said that they often eat it with cheese. They usually begin with a small dose, once or twice a week, the quantity being gradually increased, until half a grain, or a grain, or even more, is taken at one time. This habit seems in many cases to induce no untoward symptoms. Arsenic is taken for a twofold purpose. The women, and even the men, take it to clear the complexion, and to improve the personal appearance: and it is said they effect these objects. The men more frequently use it to enable them to undergo great exertion without fatigue, and they maintain that it enables them to climb mountains and accomplish fatiguing tasks, impossible otherwise. The experience of most countries is opposed to the Styrian practice, for it is generally found that the long-sustained administration of arsenic fails to induce tolerance of the drug, but, on the contrary, entails serious consequences. Even in the arsenic-eating countries, the habit is not without risk, for there it is a general opinion that many fall victims to the drug. It has been supposed that, taken in an insoluble form, the arsenic is not absorbed at all, but passes out with the motions, leaving the system unaffected by it: but Dr. Maclagan's investigations have effectually disposed of this supposition, for after witnessing a well-known arsenic-eater eat arsenic and then collecting his urine, he obtained a considerable quantity of the poison from it.

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[1] Subsequent experiments which I conducted with Dr. Sainsbury reaffirmed this statement of the greater poisonous action of arsenious acid. Binz has however put forward the view that arsenious acid in contact with the living tissues becomes converted into arsenic acid, from which state it again suffers reduction back to the state of arsenious acid. These changes constantly repeated are supposed to continue as long as the arsenic is in the system and these same changes are held to represent the toxic action upon the system. Doubtless these changes will to some extent take place, for oxidations and reductions are constantly being effected in the body (*cf.* Hæmoglobin), but that this is the special mode of action of arsenic is most unlikely, and the fact that arsenic acid is less poisonous than arsenious acid as was long ago stated by Garrod, in itself disproves it—for on Binz's theory t[illegible] should be of equal poisonous power.

Ordinary experience, however, shows that the long-continued use of arsenic produces serious symptoms, evidenced first in the eyes and stomach. The eyelids become slightly œdematous, the lower before the upper, while, usually, simultaneously, or soon after, slight conjunctivitis occurs with suffusion and smarting of the eyes, and sometimes dimness of sight. The mucous membrane of the nose, mouth and throat may be reddened and inflamed, the patient complaining of thirst and dryness of the mouth and throat. The digestion suffers, in some becoming deranged much sooner than in others; when this happens the appetite fails, and at the pit of the stomach a sensation of weight or soreness is felt, aggravated each time on taking food or the arsenic. Sometimes the stomach is affected before the eyes. On the appearance of any of these symptoms the drug must be given in smaller quantities, or it must be discontinued. Among other symptoms the skin becomes dry and dirty-looking, and a slight "branniness" may be noticed, most marked where the skin is covered with clothes. Eczema or urticaria may arise, or perhaps vesicles may appear, or there may be mere desquamation with tenderness of the palms of the hands or soles of the feet: arsenic is said to have produced pityriasis and lichen. Aching pains in the head, and swelling and inflammation of the joints are sometimes complained of. The sleep may be much broken, or disturbed by dreams. But still more serious symptoms may set in: the voice may become rough; in some cases salivation may take place; ulcers may form in the mouth; nausea, vomiting, and diarrhœa may set in with slimy and bloody motions, voided with much straining and pain; the hair, and even the nails, may sometimes fall off; cough, with bloody expectoration, may occur. With the development of these serious symptoms the patient wastes away, the skin becomes dry and hot, the pulse frequent, especially at night. Pains in the limbs, neuralgic pains, anæsthesias, tremblings, and even paralysis, may supervene, till at last the memory fails, sensation is lost, and death soon follows. The susceptibility to arsenic varies, some persons being speedily affected by two-drop doses of the arsenical solution, while others can take ten to twenty drops without injury for a considerable time. Dr. McCall Anderson states that patients while taking arsenic are liable to bronchitis, and should therefore be cautioned against exposure to cold.

In some persons the inhalation of very small doses will in time induce serious symptoms, and many cases are recorded, where serious symptoms have arisen from the use of wall papers whose pigments contained arsenic. Arsenic is largely used in the formation of pigments *other than green*. Arsenical pigments are also largely used in the manufacture of cretonnes.

Gies finds that the prolonged use of arsenic in increasing doses, continued, say, for months, has the same effect on the bones of rabbits, pigs, and fowls, as phosphorus. The bones become more compact: these changes begin in about three weeks. The animals, also, become heavier and fatter, and there occurs fatty degeneration of the heart, liver, kidneys, and other structures; this may be extreme. Ether and chloroform are said to produce a similar fatty degeneration, if their administration is prolonged.

A large dose induces the symptoms of acute poisoning. The arsenic acts as an irritant to the whole digestive canal, exciting very active inflammation in its delicate mucous membrane, and the symptoms to be expected from severe inflammation of this tract set in. But, strange to say, the symptoms following a massive poisonous dose are not invariably the same; the symptoms arising from acute inflammation of the digestive canal are, it is true, most common, and they prove fatal in four or five days, but sometimes these symptoms are almost or entirely absent, and instead of the case running the usual course of arsenical poisoning, profound coma sets in, from which the patient never wakes, death taking place in a few hours; the mucous membrane of the stomach and intestines, in such a case, may be free from all inflammation.

Among the intestinal cases the symptoms are sometimes very like those of English cholera. At the post-mortem the intestines are then found filled with a rice-water fluid, containing epithelial flakes, the epithelium is in a state of advanced fatty degeneration, and the solitary and agminated glands are much swollen.

Dr. Blachez describes a form of arsenical poisoning characterized by the presence of choleraic intestinal symptoms, with suppression of urine, cramps, and progressive coldness of the body, also with convulsions, and localized paralyses, attacking especially the extensors. If the patient survives long enough, a petechial, papular, vesicular or pustular, or a wheal-like rash often appears between the second and the fifth day.

A fatal dose of arsenic lowers the temperature of dogs and rabbits to the extent even of 4° to 7° Fah.

When injected into the blood, or absorbed from a wound, arsenic will still produce its local effects on the digestive canal, and it is likewise found in the intestines, showing that the alimentary tract is one outlet by which the poison is eliminated. When the metal is injected into the blood, or absorbed from a wound, the effects upon the stomach and intestines are said to be as severe, even, as when it is swallowed. This is perhaps hardly true, but it is evident from the foregoing facts that arsenic manifests an especial affinity for the mucous membrane of the intestinal canal.

The post-mortem examination in an ordinary case of acute arsenical poisoning shows much inflammation of the stomach, often in patches, at which patches the arsenic powder is often visible, imbedded in the thick viscid mucus. Spots of ecchymosis are sometimes seen, less commonly ulcerations; perforation is rare. The œsophagus and intestines may also show inflammation, sometimes this is most severe in the rectum. Occasionally the mouth and throat, and sometimes even the windpipe and bladder, become inflamed. The curious fact has been pointed out, that, in certain cases, notwithstanding the existence of symptoms of inflammation during life, no traces of it may be apparent after death. This absence of inflammation cannot be explained by any want of time for the arsenic to act, since in cases ending in death yet more rapidly (death may occur within two hours) severe structural changes are to be found. Ecchymoses are commonly met with beneath the endocardium. Fatty degeneration of the tissues has been already referred to as occurring in animals; it may be pronounced in man, and especially in the liver, heart and kidneys. Both in arsenical and antimonial poisoning the glycogenic function of the liver is said to be destroyed. Arsenic retards putrefaction.

Drs. Cutler and Bradford, from their experiments conducted according to Malassez's method, are led to conclude that arsenic given in health causes a progressive decrease of the number of the red and, in particular, of the white corpuscles. In simple anæmia, on the contrary, it seems to cause an increase, at first, of both red and white corpuscles, but after a certain point has been reached there is a steady diminution of both. Arsenic is useful in chlorosis and in simple anæmia, sometimes indeed succeeding when iron fails or disagrees. Some hold that the addition of arsenic increases the efficacy of iron. It is the most successful remedy in *pernicious anæmia*, an some recommend it also in leucocythæmia and lymphadenosis; larg doses will, in some cases, entirely remove the excess of whit corpuscles in leucocythæmia, though it may apparently have littl influence in increasing the quantity of the red corpuscles. In spleni leukæmia the effect upon the enlarged spleen is often remarkable, the organ shrinking rapidly under the treatment. In lymphadenosi (Hodgkin's disease), the same is often true of the enlarged glands In each case, large doses to the limits of tolerance may be called for.

Arsenic, in moderate doses, it is said, gives fulness and increased strength to the pulse. It is hence useful for the swelled feet of old or weakly persons; or, independently of swelled feet, in the case of old people with a weakly acting heart and feeble circulation, who suffer from breathlessness on exertion.

Some give arsenic in prostrating acute febrile diseases, with the effect, so they aver, of strengthening the pulse, moistening the skin, and invigorating the patient.

Arsenic has long been recommended as an excellent remedy in spasmodic diseases of the lungs; it is often useful in asthma, whether or not attended by emphysema.

Arsenic often gives great relief to a class of emphysematous patients who, on catching cold, are troubled with a slight wheezing at the chest, difficulty of breathing, especially on exertion, or at night time, and who are obliged to be partially propped up in bed; it appears, however, to be of little service when there is much bronchitis, or when the paroxysms of dyspnœa are very urgent. In this latter contingency lobelia or belladonna answers better. Arsenic is especially useful in the foregoing cases, when the difficulty of breathing can be connected with the retrocession of a rash, such as eczema. Arsenic generally relieves the wheezing and oppressed breathing, which affect some children for months and even years, and are probably the commencing symptoms of asthma.

The vapour of arsenical cigarettes drawn into the lungs is sometimes useful to prevent or to lessen attacks of asthma, also in acute and chronic coryza and in chronic bronchitis. They may be made by saturating paper with a solution containing fifteen grains of arsenite of potash in an ounce of water (Stillé).

These cigarettes may be used in chronic phthisis.

In certain curious complaints of the respiratory tract more or less allied to asthma, to which I may now refer, a dose of one, two, or three drops of the solution of arsenic, three times a day, often proves serviceable.

I. A patient is seized, perhaps daily, or even several times a day, and generally in the morning, directly on rising, or soon after, with an attack of persistent sneezing, accompanied by profuse running from the eyes and nose, and sometimes by severe frontal headache. Each attack may last several hours. Several days will sometimes elapse before the recurrence of the attack, which then is, as a rule, severe, and may last twenty-four hours or even longer. The sneezing is generally accompanied, but sometimes preceded, by itching referred to a small spot situated inside one or both nostrils, not far from the orifice, but in some cases the itching affects the whole of the inside and outside of the nose, extending sometimes even to the lips, and sometimes affecting the external auditory meatus. The throat and soft palate may likewise itch or feel rough. These attacks are excited by exposure to cold, by dust, strong sunlight, and sometimes by unascertainable causes.

II. We occasionally meet with cases, nearly identical with those just described, but presenting this difference—the attack is excited by food, is most severe after the larger meal, and lasts from twenty to forty minutes. In one case there was itching in the nose, throat and ears, occurring in distinctly periodic, monthly, attacks, which were worse in summer. Food brought on these attacks, but a chill would sometimes induce a paroxysm.

III. Arsenic is invaluable, also, in another more developed and severer form. In this we not seldom find that a patient, who is prone to catch cold, is attacked by severe and repeated fits of sneezing, with profuse, clear, nasal discharge, and severe frontal headache. Each attack, generally worse in the morning, lasts a few days, and, owing to the great susceptibility to cold, recurs frequently. Severe itching of the ala of one or both nostrils will often forewarn the patient of an approaching attack. A simple irritant such as dust may be adequate to excite a paroxysm. Continuing in this form for some time, occasionally for years, the affection may then extend from the nose to the throat, producing sore-throat, thence to the lungs, which last affection is soon followed by much difficulty of breathing, great wheezing, and free expectoration. The lung affection may last for some weeks. When this severe form has once become established, the lungs may be attacked without any preliminary affection of the nose or throat.

IV. Again, among children, we not uncommonly meet with a similar, and perhaps identical, disease. A child, of, may be, six months old, suffers from a severe attack of bronchitis, and thenceforth becomes very prone to catch cold. Upon catching cold, it is seized with frequent and incessant sneezing, lasting a variable time, sometimes a few hours, sometimes three or four days, and resulting in a bronchitis, accompanied by much fever, wheezing, and great embarrassment of breathing, severe enough even to compel the patient to sit up in bed. The coryza may sometimes precede the dyspnœa for three or four days; the shortness of breath on the other hand may continue for many days, or even weeks after the cessation of the coryza. The affection is, indeed, a form of asthma. Such patient may encounter many attacks in the year, especially during the winter, and may continue liable to them for years, and then, perhaps, lose them, or on the other hand, a life-long asthma may be engendered.

V. Then we may meet with cases such as the following:—A patient suffers from asthma for several years in succession, and then is seized in addition with severe attacks of sneezing. These attacks, strange to say, may not occur coincidently with the paroxysm of dyspnœa, the sneezing taking place perhaps in the morning on rising, whilst the difficulty in breathing comes on in the afternoon, or at night.

These cases appear to be related on the one hand to bronchitic and dyspeptic asthma, and on the other hand to hay-fever. They are allied to hay-fever in that they are liable to be excited by dust, cold, and direct irritants; to bronchitic asthma, through those cases in which the paroxysmal coryza is accompanied by a bronchial asthma, and again, to bronchitic asthma, through those cases which, commencing as an uncomplicated paroxysmal coryza, end by becoming complicated with bronchial asthma, or *vice versâ*. To the peptic forms of asthma this paroxysmal sneezing is related through those cases in which the attack is excited by food, and those others in which the patient, a confirmed asthmatic of many years, subsequently becomes afflicted with paroxysmal coryza, induced by food; the asthma in these cases may at last cease and the coryza alone remain. The following typical case further illustrates the connection between paroxysmal sneezing and dyspeptic asthma:—A child from the age of six months is subject to attacks of sneezing occurring every few months, and most commonly in winter; at the beginning, the paroxysms are not very severe, they may last from a day to a week, and are often, but not invariably, followed by an attack of bronchitis, with much difficulty of breathing, and fever. Such a patient may, even when free from an attack, suffer much from stuffy breathing after a full meal.

The following cases, occurring, during the course of four generations, in the same family, show the intimate connection which exists between intermittent sneezing and asthma:—

Mr. H., aged 35, has suffered from hay-asthma from babyhood. The attacks occur only in the spring, during the hay season, and they last six weeks. If he goes into a hayfield, nay, near one, he is immediately stricken with a severe attack of intense itching of the whole of the inside of the nose, and of the conjunctiva of both eyes (there is no complaint over the region of the frontal sinus), and also of the throat; this itching is accompanied by violent sneezing, and profuse discharge from the eyes and nose. The eyes become bloodshot, and the lids swell, sometimes to such an extent that he can scarcely see. The breathing is very difficult, but there is no phlegm on the chest. So intensely susceptible is the patient, that a field a great distance off will affect him; nay, if his children play in a hayfield and then come indoors he may have an attack. Other flowers besides those of the grasses, roses, etc., will at this time of year bring on a mild attack, but at no other time of the year. Strong sunlight may induce the attack unless the eyes are protected by large dark-glassed spectacles. *Strange to say, whilst severely affected in Sussex, his native county, he is quite free at Windermere, in Scotland, and in Devonshire, even though the grass is in full bloom*: thus, on one occasion, when suffering from a severe attack, he started for Lynton, in North Devon, and after leaving Barnstaple began to improve more and more, and during his stay at Lynton he was quite free, though the house he lived in was close to a grass field in full bloom. On one occasion, whilst yachting in St. George's Channel, though not until the fourth day from land, he was seized with a severe attack. [For the last four years he has inhaled quinine spray through his nose with marked benefit.] His grandfather was asthmatic for years, living, however, to close upon eighty-four years. His sister, twenty-four years old, has had hay-asthma for the last four years. His son, aged ten, has suffered from severe asthma dating from a sharp attack of bronchitis when three years old. This child suffers all the year round, almost continuously, from severe itching inside the nose, in the eyes, throat, ears, and under the chin. When these symptoms have become aggravated he has severe sneezing, with rather free discharge of clear fluid from his nose. Any kind of dust aggravates the symptoms, but not pollen especially as in the case of his father. He suffers also from wheezing, and when the itching and sneezing are aggravated, from much difficulty of breathing and from violent cough.

In the case of this boy all the symptoms are very greatly influenced by food; thus the itching, etc., and the dyspnœa, are always made worse by pastry, sweets, and especially by a heavy meal taken in the evening or late at night. He has been much worse since an attack of the measles, three months ago, and since then any food, even bread and butter, increases both the itching and the difficulty of breathing. He does not easily catch cold at Brighton, where, indeed, he is always free from his troubles, and during one visit to Lynton he lost all his symptoms. His stomach has lately been very delicate, so that he vomits very readily. He is very flat-chested and round-shouldered, he wheezes loudly, and his expiration is very greatly prolonged.

Thus we have a case of asthma, followed in the grandson by hay-asthma, and in the great-grandson by asthma, plus attacks of itching and sneezing, not however due specially to pollen as in the case of the immediate ancestor. In the case of the great-grandson peptic influences were strong.

The following interesting and instructive family history throws much light on the affinities of these curious complaints:—A woman, when young, suffered from bronchial asthma, which left her for some years, and then she became affected with hay-asthma. She bore two sons. One, aged nineteen, had suffered for two years every morning during the summer from violent attacks of sneezing, and profuse watery discharge. These attacks were not excited by hay nor by the smell of flowers. Another son, aged thirty, had been subject to asthma and bronchitis since five years of age. It began, and for a long time continued, of the same character as that so often seen at the commencement of asthma, especially in young children, commencing, viz., with an attack of cold in the head, with fever, lasting about three days, and followed for about nine days by asthma. (*See* Aconite.)

The bronchial asthma of the mother was most severe in the winter. From this she quite recovered, and remained well for several years; during ten years she had then suffered from well-marked hay-asthma, the attacks being apparently solely due to hay.

Her son, aged 19, had suffered for two years from violent attacks of sneezing and much running from the nose, the paroxysms lasting sometimes for hours. They were accompanied by much itching of the whole inside of the nose. There was no dyspnœa or wheezing. These attacks occurred chiefly in the morning, directly he got up, but they might seize him at any hour of the day. He could go into a hay-field, or smell flowers, without suffering the slightest trace of an attack, but was liable to an attack if exposed to dust and strong sunlight, these being the only causes he had detected; he could not account, however, for those attacks which began directly he got out of bed. The complaint would last the whole summer, but would leave him in the winter The attacks were not affected by food.

His brother, aged 30, had suffered from bronchitis and asthma since five years old. At first the attacks began with cold in the head and fever, without much sneezing. This stage lasted about three days, and then the throat became slightly sore, next bronchitis set in. To use his own words, he had generally three days' cold in the head, and nine days' asthma, though sometimes the asthma had lasted much longer, indeed, sometimes it had continued for months. As he had grown older the attacks had undergone considerable modification. The chest symptoms might now begin with a cold in the head or might occur without it. He was obliged to take the greatest care, for any chill was liable to bring on an attack. Strange to say, conditions which at one time would induce an attack were inoperative at another. Thus, he could sometimes join a hay-party without being affected, yet at other times, going into a stable, or passing a hay-cart, not to mention going into a hay-field, would bring on a violent attack. Dust, such as house dust, builders' dust, would be sufficient to excite an attack, so also would strong sunlight or the smell of flowers. An attack induced by any of these agents consisted of itching at the nose, violent sneezing, with profuse discharge from eyes and nose, the itching and discharge being usually most marked in the left nostril, though sometimes the right nostril was implicated; in addition, there was dyspnœa. The coryzal symptoms always occurred in the day, the dyspnœa at night. When troubled with asthma the dyspnœa was considerably aggravated by food, which, however, at no other time caused any tightness of the breath.

Strong black coffee, even the smell of it, immediately relieved the dyspnœa, but was without effect on the coryza.

The fumes from Himrod's powder relieved wonderfully both the coryza and the dyspnœa. All inhalations, with the foregoing exception, "tightened him up everywhere, even in the nose and throat."

In some cases the irritability appears to be restricted to the nasal mucous membrane, or even to a very limited portion of it. In other cases, after continuing in this form for some time, the mucous membrane of the throat may become involved and subsequently the bronchial mucous membrane, or *vice versâ*, the irritability, beginning at the bronchial mucous membrane, may next involve the nose. In either case the disease may quit the portion of mucous membrane originally affected, an incident most common when the attack first affects the territory of the fifth nerve. Indeed, in my experience, an irritability starting in the nose is a not unusual commencement of asthma in children; as they grow up, the coryzal symptoms may cease, and ordinary bronchitic asthma alone remain.

It will be evident that these cases of paroxysmal coryza are closely related to hay-asthma, which, indeed, appears to be the same disease, with this reservation, that, owing to the patient's idiosyncrasy, the attack is induced by the pollen of plants only; the similarity between these affections is shown by the fact that in each the mischief may be limited to the nose, frontal sinuses, and eyes, or extending further, may involve the lungs.

Mr. Blackley, in an admirable paper, shows that in his own case, and in some other instances, hay-asthma is due solely to the irritant effects of the pollen of plants. He conducted an extensive series of experiments with the pollen of many grasses, cereals, etc., and found that all are capable of exciting the attack, although some kinds of pollen are more active than others. The pollen of poisonous plants is not more virulent than that of harmless plants; indeed, he finds that pollen of solanaceous plants will excite a slight fit, while the pollen of wheat excites a very severe attack. In his own person, and in some other cases, he clearly shows that all the agents hitherto supposed to be severely productive of asthma, such as ozone, heat, strong sunlight, the volatile principles on which the odour of plants depends, oleo-resins, dust, unless it contains pollen, are powerless to produce a paroxysm. In other cases it appears that one or more kinds of pollen only will produce the attack. Thus rose-pollen only excites the attack in some patients; it is said that in America Roman wormwood is a frequent cause. Hay-asthma and the diseases just described are indeed identical, but, owing to individual idiosyncrasy, the attack is induced in one person by one irritant, and in another by a different irritant. In some cases the attack is induced by pollen, in other cases by ipecacuanha, the smell of mustard, a privet hedge, or by animal emanations, as from rabbits, cats, horses, feathers, etc. Dr. W. Smith, of Preston, narrates a case in which a linseed poultice provoked the symptoms of hay-asthma. In one case an attack was always induced by porridge. Simple dust will occasionally excite these symptoms, and sometimes one kind of dust only. Thus, a middle-aged man, an ironmonger, had suffered from paroxysmal coryza and asthma for two years, the attacks being brought on by the dust of his shop only, whilst other kinds of dust, such as that of a road, failed to affect him; flowers, grasses, and sunlight were likewise without effect upon him. This case was singular in this respect, that whilst the dust only of his shop excited coryza and asthma, yet in certain localities he suffered at night from simple asthma without coryza. Notwithstanding Mr. Blackley's careful and elaborate experiments, I cannot help believing that sunlight and great heat will in some persons bring on an attack without the intervention of pollen. I have known persons who could never look at the sun without suffering from violent sneezing. It is well known, of course, that strong sunlight and great heat will m aggravate the attack induced by pollen.

It has been said that the itching and tingling which gener accompany paroxysmal sneezing, no matter what their exciting ca may affect the whole or any part of the nose. Sometimes the ting and itching are felt inside, sometimes near the orifice, perhaps m the bridge, from these parts it may extend to the cheek or to the in the latter case it may involve only the inner canthus, in cer patients the itching may affect also the palate or throat. I remem the coryza in one case to have been accompanied and probably en by itching of the nose and soft palate, and that iodine inhalation once removed the coryza and nasal itching, but left unaffected itching of the palate, which ceased at once on the application little nitrate of silver.

It is interesting to observe the very different degrees of dev ment of this disease. In certain cases and in some seasons the a appears to be limited to severe paroxysmal itching of the inner thus. In other cases, even of true "hay-fever," the irritant e at one time this itching of the inner canthus alone; at another it will excite paroxysmal sneezing also; in a third variet attack may at first be limited to the itching, but, as it go sneezing and profuse watery discharge are superadded; in yet instances, besides the itching and sneezing, the patient suffers bronchitis and dyspnœa; lastly we have another group of ca which the irritant excites bronchitis and dyspnœa only.

In one strange variety of cases of the coryzal type a patien have violent attacks of sneezing, generally occurring in the mo but without any itching; in one such instance a lady had morning profuse watery discharge which literally ran from her and lasted some half an hour, but there was neither itchi sneezing; this discharge always ceased immediately the bowel relieved. This itching generally yields to iodine inhalation when this fails to arrest the paroxysmal sneezing.

Arsenic in many of these cases is most efficacious, at times affording relief, but in certain cases requiring ten days or a fo to manifest its remedial effects; in some cases it altogether f find it of little or no value in true hay-fever, that is, wh paroxysmal sneezing is excited by pollen. Where there is aconite, if given early, curtails the course of the attack consid (*See* Aconite.) Cases unyielding to arsenic are sometimes b by iodine inhalation, by the administration of iodide of potass by veratrum viride. The case of a young woman, twenty-tw of age, who for several years had suffered from attacks of s like those described, well illustrates the value of local appli The fits occurred in the morning, lasted several hours, and wer panied by considerable pain over the forehead; so violent [illegible] that the patient [illegible] the greater part of the [illegible] the whole of the inside [illegible] but this continued as long as [illegible] her health was failing [illegible] In this case arsenic gave [illegible] the internal administration [illegible] iodide of potassium [illegible] found useless. At this stage [illegible] inside of the nose and [illegible] fairly subsided the attack [illegible] The attacks of sneezing [illegible] and a fortnight's persistence [illegible]

Cocaine applied to the [illegible] and some patients [illegible]

Arsenic is useful [illegible] given in medicinal doses [illegible] of the mouth and throat [illegible] Of course [illegible] septics, etc., would be [illegible]

We pass to the [illegible] viz., the skin affections.

The beneficial [illegible] in the scaly [illegible] recognised. Psoriasis [illegible] it; many cases [illegible] benefited.

Hunt recommends [illegible] possible by arsenic [illegible] increasing the dose. [illegible] continuance, but [illegible] more experience [illegible] down excellent rules for its guidance.

Arsenic is [illegible] during the inflammatory stage of [illegible].

Children above five years [illegible] It is curious that girls often require a larger dose than boys.

The largest dose ever required [illegible] though some practitioners give double or even treble this quantity. As a rule it should never be given on an empty stomach.

Arsenic, if mixed with food, does not usually irritate the bowels. In the course of a few days or weeks it may produce an itching or smarting in the conjunctiva, and this membrane will appear slightly inflamed, the lower eyelid becoming at the same time a little puffed or swollen. The cutaneous disease will now begin to decline, and the dose must be reduced by [illegible]

Should the conjunctiva become much inflamed the dose must be still further reduced, but otherwise the conjunctiva should be kept just affected throughout the whole course.

If the skin affection becomes more inflamed the course must not be interrupted, but an occasional aperient must be taken.

The arsenical treatment must be continued for as many months after the final disappearance of the eruption as it (the rash) has existed years before.

These rules closely correspond to the advice given by Dr. Graves in his clinical lectures. With two statements made in this "code of regulations" my experience, however, does not quite agree, for I have not found that smarting of the eyes and swelling of the lower lid occur so often as Mr. Hunt implies, nor do I find it necessary to induce these toxic symptoms to insure the beneficial influence of the remedy.

The first influence of arsenic on psoriasis is to make it redder, more inflamed, and indeed to look worse than before treatment, a fact which, if not known, would lead to the suspension of the drug just when it is commencing to do good; the administration being continued, the exaggerated redness soon declines, and the eruption heals in the centre, leaving in a short time only a slight redness.

Chronic eczema, although perhaps not so amenable to arsenic as psoriasis, is generally benefited by it, especially in the obstinate chronic forms. It sometimes removes the rebellious eczema which affects the vulva, the verge of the anus, and the scrotum.

Arsenic will generally cure that troublesome disease pemphigus, as Mr. Hutchinson has shown, and although after a variable interval the eruption is liable to recur, it will again yield to a renewed course of the drug.

Arsenic sometimes relieves lichen and other obstinate skin affections.

In our experiments on arsenious acid and tartar-emetic, published in the *Journal of Physiology* for 1878, Dr. Murrell and I found that these two substances produced desquamation in frogs. Thus, after poisoning by arsenious acid, even then, when only $\frac{1}{16000}$ part of the weight of the animal had been administered, desquamation began in the trunk in about five hours, and in the legs in about eight hours. The cuticle stripped off in large pieces so readily, that mere handling of the animal detached it. Tartar-emetic affected the cuticle in a somewhat different way, for it changed the cuticle into a pulp or jelly, so that even whilst the frog was alive it could be scraped but not torn off. We conclusively showed that these effects were due to the direct action of arsenious acid and tartar-emetic upon the skin.

The question arises, Does arsenious acid affect all epithelial structures in this way? I think so. Miss Nunn has shown that it affects the cornea; and, as has been previously stated, after poisoning the bowels are found filled with a rice-water fluid, con ing of epithelial flakes, the epithelial cells of which are choked granules, and some indeed in a state of advanced fatty degenera these changes occur even when the poison is injected into a vein.

[illegible]

I never observed any [illegible]

[illegible] as the result of arsenic [illegible]

[illegible] the changes described above [illegible] from the cutaneous blood vessels [illegible] an excessive discharge of fluid from the cells. All the facts go to [illegible] and separating [illegible] prove that the changes are the result of the arsenic acting directly on the epidermic cell, which, with its diminished cell substance and shrunken nucleus, presents a striking analogy with the secreting cell (of a salivary gland) which has been stimulated to exhaustion, and I shall probably not go far wrong in regarding the changes of former as the consequences of an action of the poison not wholly unlike an excessive, in fact, a lethal stimulation, by which the destructive stages of the metabolism of the cells are hurried on beyond the reparative power of the constructive stages.

"The stimulation is obviously of a peculiar kind. One marked effect of the stimulation of undifferentiated protoplasm is to forward and accelerate processes of growth. I have looked diligently for indications such as double nuclei, etc., of multiplications in the epidermic cells, but always in vain. One would naturally expect that the changes which I had described would, if the animal lived and recovered from the poison, be followed by a rapid renewal of the epidermis, but I have not as yet succeeded in keeping the animals long enough to see even the first trace of it. I may remark incidentally, that the fact of the columnar layer being the first to be attacked by the poison may perhaps be regarded as an indication that the growth of the epidermis does take place from this layer, and not, as recent researches on the structure of the mammalian epiderm have suggested, from the cells of the intermediate part.

"The characteristic vertical arrangement of the undermost cells, the columnar layer of the epiderm, is a phenomenon for which it is very difficult to account. Embryologically considered, this feature seems to be a continuation of the condition of the primary epiblast, the cells of which are always vertical; but it is difficult to see what purpose is served by the preservation of this ancestral feature. It is obvious, however, from the results, which I have given, that this vertical position is maintained (for whatever reason) by some exertion of the protoplasm of the constituent cells. Immediately that the arsenic damages the protoplasm, the vertical arrangement is lost; indeed, this is the most obvious effect of the arsenic, and the one most readily recognised."

Concerning the action of antimony she says: "The structural changes in the epidermis brought about by antimony are essentially the same as those produced by arsenic. There is (1) the same marked degeneration and partial solution of the columnar layer which causes the epidermis to be held less firmly to the dermis; though previous to the hardening, the extreme softness of the cells prevents it from being stripped away as can be done in the case of arsenic. There is (2) the same degeneration and separation of all the cells of the malpighian layer, and (3) the same desquamation of the corneous and intermediate layers. The principal difference is the greater softness, or more complete isolation of the cells, and the somewhat more marked change in the intermediate layer. The cells of this layer appear more thoroughly detached from one another, and hence cavities are more frequently found between them; but their protoplasm is never formed into threads and processes enclosing spaces, as in the columnar cells. It is this separation of the constituent cells of the intermediate and also of the malpighian layer which is the chief determining cause of the pulpy or mucilaginous condition of skin in antimony poisoning mentioned by Ringer and Murrell. Altogether, the action of antimony is more rapid than that of arsenic, and the changes produced by it bear evidence of more violence. But the marked change in the columnar cells remains the most characteristic feature among the structural changes produced by both arsenic and antimony poisoning.

"Both these drugs, then, have a specific effect upon the cells of the epidermis, the one differing slightly only from the other in their fundamental action, though the results appear to the naked eye to diverge so largely. The skin, under the influence of either drug, presents a striking contrast to one which has been left to disintegrate in a natural manner after death. I have examined the skin of frogs at intervals of one to seven days after death, but I have never observed the peculiar changes which I have described above as taking place in the columnar cells. The cells of the whole epidermis become granular and more opaque, and the outlines of the cells become indistinct; the corneous layer may be thrown off, and the features of the malpighian layer become, eventually, very difficult to recognise; but at no stage does either the protoplasm of the cells become softened in the peculiar manner described, nor do the nuclei become shrunken. The desquamation under antimony and arsenic is obviously a specific effect."

Miss Nunn finds that arsenious acid and tartar-emetic affect the cornea in a similar manner, but the effects are never so marked as in the skin.

It is interesting to observe how these experiments confirm the conclusions previously arrived at by clinical study. These investigations show that arsenic affects the epidermis mainly, if not exclusively, and leaves the dermis unaffected. Dr. Duhring, in Wood's *Therapeutics*, says that diseases affecting the more superficial parts of the skin are most amenable to the influence of arsenic, and that it possesses little or no influence upon diseases seated in the deeper structures of the skin. It has no effect upon infiltrations of the corium.

If long continued, especially in large doses, arsenic turns the skin to a dirty brown colour, and this discoloration is especially marked around the orifices of the hair follicles. The colour is very like the discoloration of Addison's disease.

A long-continued course of arsenic is recommended in epithelioma, rodent ulcer, and even in scirrhus.

Few, if any, remedies are so successful in chorea as arsenic. If there is much anæmia, iron is also required; if fever or rheumatism, these must be subdued by appropriate treatment. But in simple uncomplicated cases of chorea, arsenic is by far the best remedy. Its occasional non-success is sometimes owing to the undue smallness of the dose, and decided improvement often begins simultaneously with a freer administration of the medicine. When chorea has resisted smaller quantities, children may take four, five, or more minims of the solution. In one case which improved rapidly, I quickly increased the dose until the boy took twenty minims of the liquor arsenicalis six times a day, and in another successful case the girl took fifty minims of the liquor daily. Dr. Seguin gives two to five minims at first, and quickly increases the dosage by adding a drop to each dose daily. If arsenical symptoms arise, he intermits the arsenic for forty-eight hours. He finds that in the case of most patients, doses of 20, 25, or 30 drops thrice a day may be reached. Perrorid uses arsenic hypodermically with great success. Arsenic is well borne this way, and does not derange the stomach. According to Bartholow, the first to use arsenic hypodermically was Dr. Radcliffe. Two to ten minims of Fowler's solution may be thrown into the muscles daily. Dujardin-Beaumetz injects one to four minims, or more, of Fowler's solution mixed with fifteen minims of liquid vaseline, as less irritant (Yeo's *Medical Treatment*).

Arsenic has been found serviceable in epilepsy.

Arsenic is often useful in neuralgia. Dr. Anstie speaks highly of it in various neuralgias; it not unfrequently cures dull throbbing pain affecting one brow. In angina pectoris, a disease he regards as a neuralgia, he states that it will lessen the severity of the attacks, and in time reduce them to a mere "tightness of the chest."

With the exception of quinine, no drug subdues intermittent fever like arsenic. Some indeed, with large experience, count arsenic as equal, if not superior, to bark in ague. The greater number of observers, however, do not credit arsenic with such pre-eminent virtues, maintaining that cinchona cures the disease more quickly and more certainly, and that it is especially to be preferred in those malignant forms which, unless at once arrested, destroy life speedily. A concurrence of testimony tends to show that arsenic is most useful in *long-standing agues*, especially of the quartan type.

Arsenic has lately been extolled in phthisis and in tuberculosis. It improves the appetite, increases assimilation, lessens expectoration and cough, and promotes the cicatrization of cavities. It is stated that it will reduce the temperature in tuberculosis, and after carefully investigating this subject, I am inclined to believe that this is so; at least I have frequently observed a steady and sustained fall of the thermometer to follow the use of arsenic in cases where the febrile temperature had continued unchanged for a considerable time, and this I have known happen twice or three times in the same case on reverting to arsenic after it had been discontinued. The decline generally takes place gradually, and may begin soon after taking the arsenic, or the fall may be postponed for ten or twelve days. Moreover, I have seen children in a hopeless state from severe tuberculosis involving lungs, intestines, and peritoneum, who have steadily and slowly improved and ultimately recovered under arsenical treatment, and I have observed a like result in adults with phthisis, in the subacute and chronic forms. It must, however, be admitted that this is a very intricate subject, seeing how irregular is the course of the fever of tuberculosis, and how sometimes cases the most desperate recover by means of other treatment, or indeed with little or no treatment. Still, I am sure that the action of arsenic in phthisis and tuberculosis is well worthy investigation. In my experience it is especially useful in fibroid phthisis and in chronic phthisis with much fibroid induration. As to dosage, I have generally given from two to four minims every two to four hours. Only in a few cases is arsenic ill borne, producing sickness and pain in the stomach and bowels. Osler states, "there is no general tonic more satisfactory in cases of tuberculosis of all kinds than Fowler's solution." This, perhaps, represents the view generally entertained in this country as to the value of arsenic in phthisis and other tuberculous affections.

Arsenic is often serviceable in rheumatoid arthritis and nodosity of the joints, but the indications for its employment are unknown. The pains of this troublesome affection are sometimes increased, sometimes benefited, by heat; some cases are worse in summer, others in winter; some are worse during the day, others at night. All these forms will sometimes be cured by arsenic, yet its action is capricious, for in cases apparently identical it sometimes fails and sometimes cures. Its effects are sometimes astonishing, stiffened joints, for a long time considerably enlarged, becoming reduced to their natural size, and regaining their suppleness. Large doses are necessary, and must be given for a considerable time; and it is to be borne in mind that if improvement does not ensue speedily, it must not be concluded that the medicine will ultimately fail. Some consider it necessary to produce the toxic effects of arsenic, but in many cases improvement results without pushing the remedy to this extent.

In the administration of arsenic we may remember Garrod's statement, that arsenic acid is less irritating to the stomach than arsenious acid. This fact, however explained (*see* footnote, p. 294), is in keeping with what we know concerning phosphorous and nitrogen compounds, for phosphates and nitrates are less active than phosphites and nitrites respectively. The effect of the additional atom of oxygen seems to be to saturate, or neutralize more completely the activities of the ruling element.

We should also remember, for practical purposes, that idiosyncrasy plays an important part in the therapeutics of arsenic, and that some persons are highly intolerant of it, to such an extent that one minim of the liquor arsenicalis will produce violent action upon the stomach and intestines.

The best antidote for poisoning by arsenic is the freshly precipitated ferric hydrate. If, instead of carbonate of soda, we use magnesia as the precipitant of the iron hydrate, we obtain the ferri oxidum hydratum cum magnesia, which gives probably the best antidotal combination; it is the official antidote of the German Pharmacopœia. (*See* Wood's *Therapeutics.*) Dialyzed iron, or other basic preparations of iron, will serve as a substitute.

PHOSPHORUS

PHOSPHORUS in large doses is an irritant poison, but the symptoms are sometimes delayed for hours, or even days; they occur early if the drug is given in solution as in ether, more slowly when given in the solid form. The patient complains of burning in the throat, with intense thirst and a severe burning pain in the stomach; this is followed by distension of the abdomen and the vomiting of a dark green or black substance having the odour of garlic: sometimes the vomit is phosphorescent. Along with these symptoms there are the usual evidences of collapse. In the less severe cases, vomiting ceases on the second or third day, but upon the occurrence of jaundice, which often happens, the sickness returns, and the rejected matters contain dark-coloured blood. There will now be pain and tenderness over the liver, and generally diarrhœa, later the stools become clay-coloured. At first, it is said, there may be fever, the temperature rising even to 102°, but subsequently the temperature sinks below normal, sometimes considerably, in one case it fell to 89° Fah. in the rectum. The jaundice mentioned sets in from the second to the fifth day; the liver, at first, is apparently enlarged, but afterwards its size diminishes considerably; it undergoes marked fatty degeneration. Jaundice may be absent even with advanced fatty degeneration of the liver. The urine is generally scanty, albuminous, and sometimes bloody; it deposits epithelium cells, and when there is jaundice it contains biliary acids and colouring matter with leucine, tyrosine, and para-lactic acid. The urea disappears almost entirely towards the termination of a fatal case. Hæmorrhage and purpura often occur, and wounds bleed inordinately and sometimes uncontrollably. Later, delirium sets in, or coma, and this may terminate in convulsions. The *post-mortem* reveals most of the tissues in a state of advanced fatty degeneration. In the stomach and intestines, there is a general inflammation of the glandular structures, and hence the mucous membrane is thickened and whitish; the epithelium is granular or fatty and much degenerated, or even broken up. The liver is either enlarged, with its cells in a state of advanced fatty degeneration, or it is contracted from destruction and absorption of the cells. The kidneys are similarly affected, the epithelium being swollen, granular, fatty, or broken up. The heart, the voluntary muscles, and other structures are similarly implicated. The fatty degeneration affects likewise the whole of the arterial system, down to the microscopic arterioles (Wegner). The number of the blood discs is said to be lessened.

The fall in the body temperature has been mentioned, as occasionally considerable; in dogs and rabbits, fatal doses of phosphorus will lower the temperature 8° to 12° Fah.

The main stress of the poison falls sometimes on the gastro-intestinal mucous membrane, sometimes on the nervous system, and sometimes on the blood and blood-vessels; in this latter case it gives rise to hæmorrhages.

The duration of acute poisoning is very variable; the patient may die in two or three days, but more generally survives for one to three weeks. Recovery is slow.

Jürgensen claims to have saved several lives by direct transfusion of human blood.

The effects of chronic phosphorus poisoning have been elaborately worked out on animals by Dr. George Wegner, with most singular results. It has long been known that workmen exposed to the fumes of phosphorus are liable to necrosis of the jaw, and Dr. Wegner believes that this results from the direct action of the phosphorus on denuded bone, and that necrosis will not set in unless, through wounds or carious teeth, there is some destruction of the soft tissues, thus enabling the phosphorus to reach the exposed bone; in support of this view he adduces the following arguments:—1. If the periosteum of an animal is severely wounded, but phosphorus is given in the form of a pill, even though administered for months, the periosteal changes do not take place. 2. If the tibia of a rabbit is partially bared, a healthy granulating wound is soon established, but under exposure to a phosphorous atmosphere, periostitis is set up similar to that observed in the jaw. 3. Many workers in phosphorus escape, whilst those who do suffer have carious teeth.

The lower jaw is the more often affected, but the upper is liable to be attacked; in rare cases even the palate and frontal bones may suffer.

Dr. Wegner found that by gradually increasing doses of phosphorus or of phosphorus fumes, administered to rabbits, congestion of the mucous membrane of the stomach is produced, this membrane becoming of a brown colour and three times its natural thickness. The liver becomes chronically inflamed, with a great increase of the interstitial tissue, appearing earliest in that portion surrounding the acini. This new tissue contracting, produces atrophy of the live-cells, and obstruction of the vessels and ducts. The organ, at first [illegible] nd livid in colour, may gradually change into the hob-nailed liver, or into a shrunken irregular mass, deformed by contracting bands.

Given in doses too small to affect the stomach and liver, phosphorus modifies the bones, especially those of growing animals. Thus, where spongy tissue should be formed in the growing bone, dense solid tissue takes its place, which, examined by the naked eye and microscope, is found to consist of well-formed bone; if the administration of the phosphorus is continued, the proportion of dense bone increases, and the remaining cancellous structure, in accordance with a natural process, becoming absorbed to make room for marrow tissue, at last no cancellous structure is left. Subsequently the solid, newly-formed bony tissue itself undergoes absorption. Changes occur likewise in the bony substance formed by the periosteum. The new bone looks natural, but the microscope reveals that it is dense, and that compact masses of it encroach on the Haversian canals, producing in them at last a general narrowing; this may even affect bone formed previously to the administration of the phosphorus. If phosphorus is given for a long time to adult animals, the spongy tissue thickens, and the compact tissue becomes still more dense, and after a time new bony tissue is deposited on the inside of the shaft, increasing till the bone actually becomes solid. The chemical composition of the bone remains natural.

Dr. Wegner found also that under the influence of phosphorus, the callus after fractures or resection becomes more dense, and the formation of new osseous tissue is favoured. Kassowitz has very successfully treated 560 cases of rickets with phosphorus in doses of $\frac{1}{30}$ gr. dissolved in oil.[1]

The changes above described are produced by phosphorus as such, and not after its conversion into phosphoric acid. For phosphoric acid does not produce these peculiar changes in the stomach and liver.

In acute poisoning, phosphorus itself is absorbed unchanged, for in some cases the breath, the urine, and, after death, the tissues themselves, are luminous; moreover, it has been chemically detected as free phosphorus in most of the tissues.

The jaundice occurring in acute phosphorus poisoning has been variously explained. Dr. Ebstein holds that it is not due to destruction of the liver-cells, but to catarrh of the small biliary ducts, causing obstruction and leading to absorption of the bile. The ductus communis choledochus has sometimes been found occluded by a tenacious plug of mucus, thus co-operating with the obstruction of the smaller ducts in the production of jaundice. The presence of biliary acids in the urine, when jaundice occurs, certainly supports the view that the jaundice depends on absorption from obstruction of the ducts, rather than from a suppressed secretion owing to the destruction of the liver-cells.[1] Sometimes the contents of the intestines are found destitute of bile.

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[1] It is doubtful whether this large dose of phosphorus will have been in an active state; the pharmacy of phosphorus is very difficult, in particular the dosage.

According to Mr. Ashburton Thompson, the effects of repeated medicinal doses are, improved appetite, increased rate of circulation, heightened temperature, perspiration, irritation of the skin, abundant urine, sometimes loaded with deposit, sharpening of the mental faculties, increase of muscular power, sensation of well-being, sometimes nervous excitement shown by hesitation and trembling (effects more readily induced in some persons than in others), even slight clonic convulsions, occasionally some venereal ardour, and, less frequently, a more acute tactile sensibility.

But sometimes, even after doses considered to be medicinal, we get sickness and jaundice which may last weeks or months. The drug appears to affect some persons much more readily than others, and this uncertain action, long known, used to be ascribed to "idiosyncrasy." It has been asserted that phosphorus in medicinal doses causes sometimes hæmaturia and albuminous urine, but this must be unusual, for having employed phosphorus in a very large number of cases, I have never seen this result.

Phosphorus has lately been given in neuralgia with considerable success. It appears to be efficacious in neuralgia of any part of the body. Some regard phosphorus as well-nigh a specific in this affection. As might be expected, chronic cases take the longest to cure, but in all the instances, susceptible of benefit, relief follows the first few doses. Mr. Thompson employed large doses, giving never less than one-twentieth, and generally one-twelfth, of a grain every three hours. Some writers think one-hundredth of a grain a sufficient dose. (*See* previous footnote.)

The most intractable and severe cases generally occur, as Dr. Anstie pointed out, in the degenerative period of life, but even in these instances phosphorus may prove useful. My own experience hardly warrants me in speaking so enthusiastically of this drug as does Mr. Thompson. Yet, though it not uncommonly fails in the severe forms of neuralgia of middle and advanced life, still it must be considered as one of the most valuable remedies. In my hands it has yielded less satisfactory results in sciatica than in many other forms of neuralgia. Phosphorus is probably most efficacious in typical neuralgia, and much less useful, according to my experience, in those imperfectly-developed cases where the neuralgia appears to be allied to, or passes into sick headache or is difficult to differentiate from muscular pain, as in the case of pleurodynia, and in those instances of pain which lack many of the more distinctive characters of neuralgia. Thompson, however, recommended it strongly in migraine. Phosphorus is often serviceable in angina pectoris, a disease sometimes closely allied to, if it be not a true, neuralgia.

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[1] This test, the presence or absence of bile acid pigments, is, with further experience, not regarded as a reliable means of deciding between the obstructive and non-obstructive (so-called) forms of jaundice.

Phosphorus is certainly useful in over-taxation of the nervous system by work too arduous or too anxious. In these patients the brain power is weakened, and the mind soon becomes weary and fatigued; such patients are irritable and depressed, and sexual capacity in many instances is much impaired. Here a prolonged course for several months of $\frac{1}{30}$ to $\frac{1}{50}$ grain, thrice daily, is often very useful. It appears to promote the nutrition of the nervous system.

Hammond commends phosphorus in cerebral softening and in hysterical paralysis, and Anstie in chronic alcoholism.

Phosphorus is recommended in melancholia.

A large dose, so Thompson taught, acts as a stimulant to the brain, and fits it for unusual exertion, and so obviates physical and mental exhaustion or depression from overwork.

Dr. Bartholow recommends phosphorus in the wakefulness depending on cerebral anæmia and in the wakefulness of the aged. It is useful in the degenerative changes due to age, and under its use I have seen many cases improve. Cod-liver oil, also, is beneficial in the same class of cases, and should be given simultaneously.

Dr. Fleischmann, of Vienna, approves its use in pneumonia, especially if accompanied by *typhoid* symptoms.

Phosphorus is said to stimulate the sexual functions, and patients have told me that they were constrained to discontinue this drug, because it gave them trouble in this way. Old men, whilst taking phosphorus, have told me that it had produced a return of sexual capacity.

Mr. Thompson held that phosphorus, unless given in large and unsafe doses, is neither an aphrodisiac nor is useful in spermatorrhœa, but that in small tonic doses, $\frac{1}{30}$ to $\frac{1}{50}$ gr., it will remove the physical and mental debility induced by spermatorrhœa.

Dr. Richard Hughes recommends phosphorus in chronic inflammation of the rectum.

Bartholow recommends it highly in acne indurata.

It has been asserted that phosphorus increases largely the quantity of urea of the urine, splitting up, it is said, the nitrogenous tissues and converting them into fat and a compound which ultimately forms urea; others hold that the fatty degeneration is due to deficient oxidation. In man the products of nitrogenous disintegration appear in the urine as leucin and tyrosin. Phosphorus gives to the urine a smell of violets or of sulphur. (*See* Turpentine.)

Phosphide of zinc, in $\frac{1}{3}$ gr. to $\frac{1}{2}$ gr. dose, has been strongly recommended in place of phosphorus. In compounding phosphorus it must not be mixed with turpentine, since with this, and probably with other essential oils, it combines and forms an inert compound; indeed, turpentine itself is used as an antidote in phosphorus poisoning.[1] Eulenberg and Guttmann point out that with a solution of a copper salt phosphorus immediately forms a phosphide of copper, and Bamberger's experiments lead him to conclude that copper salts are far more efficient antidotes than turpentine. The sulphate being strongly emetic is especially useful. Three to five grains should be given every five minutes till vomiting ensues. (*See* Turpentine.)

Red allotropic phosphorus is inert.

The disagreeable eructations which occur when taking phosphorus are due to the oxidation of phosphorus, and the liberation of hydrogen, the nascent gas uniting with phosphorus to form phosphide of hydrogen.

The pharmacy of phosphorus is difficult on account of the avidity of phosphorus for oxygen, it being difficult to present and keep the phosphorus in an active form, and of a measured strength. In any case the drug should *not be long kept*, in any of its preparations. According to Martindale the French *perles* or globules of phosphorated oil are both active and stable, but their dosage is overstated.

The hypophosphites contain phosphorus in a state of incomplete saturation, and their action and therapeutics partake accordingly of the action and therapeutics of free phosphorus. (*See* Hypophosphites.)

COLLODION

COLLODION is useful in many ways. It is used to adjust accurately and bind together the edges of cuts and wounds, and to exclude air. It is sometimes applied to chapped hands and chapped nipples; but for these affections there are better applications, *e.g.* glycerine of starch, arnica cerate, or a mixture containing two parts of eau de Cologne and one of glycerine. For chapped nipples, often so difficult to heal, equal parts of sulphurous acid and glycerine form a useful combination.

Collodion, painted over a superficial erysipelas, over slight burns, or patches of herpes before the vesicles have developed, subdues the inflammation, eases the pain, and checks vesication. Unfortunately, the ordinary contractile collodion coating often cracks and admits air, and so ceases to be efficacious; hence this form of collodion is inferior to a solution of nitrate of silver in water or in nitrous ether. (*See* Nitrate of Silver.) On the other hand the flexible collodion of the pharmacopœia, though less liable to crack, is less contractile, and some, doubtless, of the powers of collodion to subdue inflammation depend upon this contractile quality.

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[1] The oil of turpentine best suited to act as antidote is said to be that known as French oil of turpentine. It would appear that turpentine long kept in contact with the air becomes more resinous and more suited to act as antidote, accordingly, such *old turpentine* should be employed.

Dr. Hare, we believe, first employed collodion for boils. There are many kinds of boils. The common form begins as a pimple or pustule, whence the inflammation spreads, producing a hard, painful swelling, the centre of which, dying, forms a core. Now if collodion is applied at the papular or pustular stage, the swelling around the pustule subsides, and the further development of the boil is arrested; in the pustular stage collodion appears to be useless if the pustule has burst. After the collodion application, the matter must not be let out, or inflammation recommences, and the boil follows the usual course. It is desirable to apply fresh coatings of collodion over the old ones, allowing them to remain till the pustule has dried up, and the sore has healed. If much pus accumulates beneath this covering, causing considerable pain, the collodion should be incised under carbolic acid, and the pus allowed to escape, the subsequent treatment being conducted on Lister's carbolic acid plan. This collodion treatment allays the great irritation which often accompanies the early stages of boils. Dr. Hare prefers the contractile collodion, attributing its success mainly to the pressure which it exerts. I have succeeded with flexible collodion, but perhaps the contractile would have answered still better.[1] Some doctors add a drachm of spirit of turpentine to each ounce of collodion.

Collodion, also solutions of gutta-percha, or of india-rubber in chloroform, prevent the pitting of small-pox; the flexible variety of collodion is better adapted for this purpose than the simple collodion.

A mixture of collodion and carbolic acid is useful in toothache due to an exposed and inflamed pulp. A jelly is made by melting in a test-tube some crystallized carbolic acid, and then adding an equal quantity of collodion. A portion of this preparation on a small piece of cotton wool is inserted into the hollow painful tooth; momentarily it may aggravate the pain, but this, in a few seconds, begins to diminish, and soon ceases.

Contractile collodion, with which some mix iodine, painted over the inflamed part in acute gout, will speedily relieve the pain, although for a brief space the application will increase it. Too many coats must not be applied, lest the contraction become too great and by dragging on the skin, excite a good deal of pain, or even produce vesication.

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[1] The extension of a carbuncle may sometimes be limited by tightly strapping the part with strips of adhesive plaster, applied concentrically from the border inwards, around and over the swelling. Dr. Planat recommends highly the application of arnica ointment (one part of extract of fresh arnica flowers to two of honey) spread on diachylon plaster and placed over the boil, the application being renewed once or twice a day. He finds the internal use of arnica beneficial.

Sir D. Corrigan treats the incontinence of children with collodion. The prepuce is drawn forward by the left hand, and the little cap thus formed is smeared over with collodion at its extremity; this contracting, draws closely together the edges of the prepuce, and effectually prevents the exit of urine. A fortnight of this plan, which gives no pain and does not prevent sleep, suffices sometimes for the cure. When it is needful to pass water, the little cap of collodion can be easily chipped off with the nail. The prepuce in the morning is found distended with urine. Sir D. Corrigan thinks that it would answer as well to paint the collodion over the orifice of the urethra. This plan I find unsuitable for girls, as it excites smarting, and induces them to pick off the collodion.

Two parts of glycerine to a hundred parts of collodion yields a mixture which sets without contracting or dragging upon the skin. Eight to ten drops of castor oil to the ounce of collodion also yields a flexible and but slightly contractile film. Where simple protection of a part is sought, some variety of flexible collodion should be employed; but where in addition we wish to exert pressure, we shall have recourse to the plain collodion. Special effects can be brought to bear on the affected part by specially medicating the collodion; thus croton oil or iodine can be introduced as irritants, cantharides as a vesicant, tannic acid as a styptic, salicylic acid as a special agent for acting upon epidermic overgrowths, corns, etc., carbolic acid as an antiseptic, and so forth.

COD-LIVER OIL.
ALMOND OIL.
POPPY OIL.
HEMP-SEED OIL.
LINSEED OIL.
COCOA-NUT OIL.
DUGONG OIL.
PALM OIL.
LARD.
SUET.
WAX.
ETC.

FATS, in one form or other, are found abundantly in both the animal and vegetable kingdoms, showing their great importance in organic life.

Fats are necessary foods to the animal body, being heat-giving, force-supplying, and plastic. Their combustion contributes mainly to the generation of the heat of the body. They are essential to tissue formation, for without them nutrition and growth would be very imperfect, if not impossible. Their combustion, moreover, supplies most of the force appropriated by the nitrogenous structures, and by them converted into muscular force, secretive force, nerve force, etc.

For the most part, all fats, so far as we know, have sin physical properties, differing however considerably in degre in their melting points. In their chemical nature they differ much, though constructed for the most part upon the same type; after entering the blood they are very possibly converted into a fat of uniform composition.

Oils and fats are used to lubricate and to render supple the skin when it has lost its elasticity, and has become dry, hard, and liable to crack, as, for instance, in many scaly diseases, such as psoriasis and xeroderma. They should be employed in conjunction with warm baths.

Because of their emollient action fats and oils are in general use as excipients for the application of various agents to the skin.

Fats, moreover, are applied to the exterior of the body to protect the surface and prevent irritation, *e.g.* from excreta such as the urine or fæces, or from acrid discharges, such as we meet with in eczema; when used for this purpose, some other substance, such as the oxide of zinc, is often incorporated with them.

Simple oils are used to soften and facilitate the removal of scabs, as in impetigo, eczema, and favus. Poultices are useful in these cases prior to the removal of the scabs or the epilation.

Oils are sometimes, and with occasional success, rubbed into the skin of the whole surface, to prevent the debilitating sweating accompanying exhausting disease, as in phthisis, but this process is inferior to that of sponging the skin with a weak acid wash, and to other means. Among the ancient Romans, during the period of the decline, when warm baths were so much indulged in, it was the custom to anoint the body with fats, to check the profuse sweating caused by this enervating habit.

Fats are sometimes rubbed into the skin with a view to their absorption, so as to minister to the nutrition of the body.

It has been asserted that the inunction of the body with fatty substances will induce a considerable fall in the temperature, but in a solitary test instance I found this statement to be incorrect.

Rubbing the hands and feet with some firm fat will remove the irksome sense of heat and tightness produced by the rashes of scarlet fever or of measles.

Some practitioners treat scarlatina solely by inunctions, anointing thoroughly the skin of the whole body twice or three times a day with a bland fat, or oil, which is not to be wiped off during convalescence from scarlatina. Dr. Budd, of Bristol, recommends this inunction of oil; the patient takes a bath at night, and after being wiped quite dry, a bland oil, such as almond oil, is rubbed over the whole body. This treatment is said to assist desquamation, and to prevent sequelæ; moreover, it probably lessens the risk of contagion by preventing the diffusion of the branny particles of the skin by currents of air. Whitla recommends the use of a weak carbolic oil, 1 in 50, before desquamation, 1 in 25, after this has set in. Oil of eucalyptus in similar strengths may be substituted for the carbolic acid.

In cases of ringworm, to prevent the extension of the disease, it is a useful practice to grease the head very freely, so as to hinder the sporules from reaching the unaffected hair. The uncontaminated members of the family should also grease the hair freely for the same purpose; it would probably be more preventive still to use a mild mercurial pomade, or quinine dissolved in glycerine, so that any floating sporules might alight on some substance destructive to them.

Oils and fats are not used topically in diseases of the mouth, nor do fats undergo alteration in this cavity, and they are almost as little affected in the stomach. If enclosed in albuminous walls, as they exist in the living cell, this envelope is dissolved, and the fat is set free. Although themselves not acted upon by the stomach, fats, however, act upon the other forms of food; they certainly promote the fermentation of sugar and of starch, and it is generally accepted that fats, by assisting those chemical changes which constitute digestion, aid in the conversion of the nitrogenous foods. For example, fats assist in the fermentation of milk, and promote the process of artificial digestion; this action of fats upon food can be demonstrated outside the body. But how fats effect these changes, and whether at the same time they themselves are in any measure modified in constitution, are questions at present quite unsettled. The importance of this property of fats must be sufficiently apparent, and needs no further comment. In large quantities they hinder digestion, possibly by their decomposition, with the formation of acids foreign to the stomach.

Fats are mainly, if not exclusively, digested and absorbed in the intestine. The pancreatic ferment steapsin causes some of the fat to take up three molecules of water and produces glycerine and a fatty acid. Pancreatic secretion also emulsionizes fats; this it effects to some extent, perhaps chiefly, by means of the splitting up of the molecule just described, for the fatty acid thus liberated becomes a soap with the alkali present in the intestine, and this soap acts as an emulsifiant. The further action upon fat is due to bile. Bile also emulsionizes fats.

It has been surmised that fat may become saponified, and so pass through the walls of the intestines into the blood, and probably a small part does actually pass into the circulation in this form; but, since much unsaponified fat is visible in the epithelium cells covering the villi, and much also can be extracted from the chyle, the chief part must undergo absorption in another manner.

The passage of fats through the moist animal membranes forming the intestinal canal is probably ascribed justly to the action of the bile; and in support of this proposition, apart from other evidence possible to adduce, it may be advanced that—

I. In capillary tubes moistened with water fats rise scarcely at all;

but if the tubes are moistened with bile the fats rise from twelve to fourteen times higher.

II. While fats pass with extreme difficulty through moist, animal membranes, if these are moistened with bile the fats, as may be shown experimentally, traverse them readily.

To a small extent also, fats pass into the blood by the agency of the intestinal juice, an alkaline and emulsifying secretion.

The chief part of the fat passes into the lacteals; a little into the veins, to be conveyed to the liver, there to be converted into cholic acid (at least, it is probable that oleic acid undergoes this change). The cholic acid having suffered a further synthesis into glyco- or tauro-cholic acid, unites then with the soda set free in the blood when the hydrochloric acid of the gastric juice is poured into the stomach, and so forms a kind of soap, namely, the tauro-cholate and glyco-cholate of soda. These again find their way into the intestines, and after serving their destined purpose there, the base reunites with the acid of the gastric juice from which it has been separated, the bile acids being liberated.

The influence of fats on the secretion of bile varies according to circumstances; if taken on an empty stomach, fats lessen the biliary secretion; if taken with, or after food, they increase it.[1]

As food augments greatly the flow of bile, we have here an indication, abundantly corroborated by experience, to give fats either with or soon after a meal.

The melting-point of a fat will influence its absorption; for if this point is above the temperature of the body, the fat, unless dissolved in other more liquefiable fats present, must remain unabsorbed.

The stomach tolerates animal fat far better than vegetable fat: for this reason, animal fats may be given in larger dose, and for a longer time, hence the medicinal superiority of animal over vegetable fats.

There is a limit to the quantity of fat which can be absorbed by the body. In regard to cod-liver oil, at first only a small quantity is taken up, and often, for some weeks even, some of it appears in the motions, but gradually more and more of it becomes absorbed, till full doses are borne, and find entrance into the circulation. In too large quantity, however, this oil is liable to decompose, and to form hurtful products, exciting nausea, vomiting, colic, and diarrhœa. On account of the limit to the powers of absorbing fats, and to the irritation which an excess of oil in the intestinal tube is liable to excite, to say nothing of economy, it is undesirable to give more fat than can be appropriated. Too large a dose is both wasteful and harmful. By examining the motions day by day we can at any time ascertain if too much is administered.

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[1] More recent investigations throw doubt upon the cholagogue action of fats. (Hammarsten, *Physiologische Chemie*, 1895, p. 196.)

Catarrh of the intestines is a condition unfavourable to the absorption of fat. Oils are sometimes given after a poisonous dose of a corrosive substance, for the purpose of forming a protective sheathing to the mucous membrane, but it is impossible to give a coating of oil to a membrane moistened with water. Cod-liver oil sometimes overcomes the obstinate habitual constipation of children. Figs kept in Lucca oil, and one or two eaten daily, are gently relaxing.

Fat is present as a very fine emulsion in the lacteals and blood-vessels, and, circulating, gradually suffers absorption by the tissues. Its very fine subdivision enables it to pass without any difficulty through the capillaries.

Fats, as we have said, are heat-giving, force-supplying, and plastic. In common with other combustible substances, they, through oxidation, uphold the temperature of the body. This, though an important is not their only, nor their most valuable, function.

Fats are necessary both to growth and nutrition, for in the most vitally-endowed organs fats are found in excess, and they abound wherever cell-growth proceeds rapidly; they are present even in disease, for much fat is found in fast-growing cancer. Fats are found, moreover, associated with the more highly-organized constituents of the tissues and fluids of the body, thus the fat existing in pus is chiefly associated with the corpuscles, comparatively little being found in the liquor puris; and again, more fat is found in plastic than in non-plastic formations. In fact, observations, day by day, demonstrate more and more the importance of fats as tissue-forming substances. Facts such as these bear obviously on the use of the members of this group in disease, but to this subject we shall return shortly.

Observations tend to show that fats are force-yielding substances, and that the peculiar forces of the body are mainly derived from the fats we consume. Only a short time ago it was considered that the forces of the body were derived from the combustion of the nitrogenous structures, but many circumstances tell conclusively against this hypothesis.

1. After severe and prolonged exercise, the urea of the urine is scarcely increased; and as this substance is a measure of the consumption of nitrogenous materials, it follows that at such times but little of it in excess of the normal is consumed.

2. Under exertion, enormous quantities of carbonic acid are exhaled from the lungs, pointing indubitably to the combustion of carbo-hydrates, or of fatty substances, the urea at the same time not being increased.

3. It has been found by experiment that, when only starchy and fatty foods are eaten, great exertion and prolonged labour can be endured, while at the same time the urea of the urine is but little increased.

The combustion occurs chiefly in the muscles themselves, not in the blood, for when the muscles are separated from the body, and made to contract under a bell-glass, they are found to yield, during the time of their activity, an enormous quantity of carbonic acid.

Drs. Cutler and Bradford, using Malassez's method of counting the red corpuscles, find that in health cod-liver oil causes an increase in the number of red corpuscles, and a slight increase in the white.

Dr. John Day (of Geelong), by ingenious experiments, showed that fats possess considerable power of converting oxygen in the presence of moisture into peroxide of hydrogen, also that the colouring matter of the blood decomposes this rapidly into water, and nascent oxygen with its characteristic active properties, and he suggests that fats may play this important part in the blood, making inert oxygen of the atmosphere into active oxygen. His experiments show that the iron of the colouring matter of the blood is probably the agent which decomposes the peroxide of hydrogen. Ether also possesses great power to form oxygen into peroxide of hydrogen, and Dr. Day suggests that the efficacy of etherized cod-liver oil may be due to the large quantity of peroxide of hydrogen which it contains.

Fats being necessary to growth, nutrition, and the due performance of the bodily functions, are peculiarly suited to convalescents from acute general diseases. Fats are also useful in many chronic affections. On the subsidence of many acute inflammations, as of the kidneys, heart, or lungs, a chronic, but not less fatal, condition may be left, a condition the danger of which is in proportion to the poorness of health of the patient previous to the acute attack. If the patient's health had been impoverished, or if he is the subject of tuberculosis, or of scrofula, many sequelæ are apt to occur. Middle-aged and old people, in whom the nutritive processes have begun to flag, are more liable to chronic disease after an acute attack. A like danger threatens children whose previous health has been damaged by unhygienic conditions. In all these states fats are very beneficial. They also benefit the chronic degenerative diseases of old age. In these and other maladies depending on deficient nutrition, fats as special promoters of this function are very useful.

The dependence of chronic affections on the state of general nutrition may be shown in another way. Persons are found who, suffering from some slight local affection, are little troubled so long as the health is unbroken, but inasmuch as the weakest link of the chain is the first to yield, so at once if the general health gives way, the local mischief becomes immediately developed or aggravated. Thus these individuals are able to measure the state of their general health by the condition of the local disease. Here, any treatment restorative of the general health will reduce the local affection to its former unimportant dimensions, and for such purpose cod-liver oil is often indicated.

Experience confirms the efficacy of cod-liver oil in many chronic inflammations of the heart, lungs, and kidneys, and in the sequelæ of the acute specific diseases, such as the chronic discharges from the ears or nose so often left by scarlet fever or measles.

Cod-liver oil is of special service in scrofula, tending to remove the various manifestations of this disease, such as chronic discharge from the ears and nose, strumous ophthalmia, strumous disease of the bones, strumous abscesses, etc.[1]

In the treatment of phthisis cod-liver oil stands pre-eminent. The term phthisis, however, includes several distinct clinical varieties. For our purpose it is sufficient here to divide these into the febrile and non-febrile, *i.e.* into those forms which manifest preternatural heat of the body, and those in which the temperature is natural, or rises only occasionally, and for a short time. The existence of fever in the febrile forms of phthisis is by no means an indication of the uselessness or harmfulness of cod-liver oil, for in this condition many patients derive considerable benefit from it. In this form of phthisis, as, indeed, in all forms, we must be guided, in the employment of this remedy, not only by the nature of the disease, but also by the state of the patient in other respects. If the digestion is good, cod-liver oil may generally be given with advantage; but if the stomach is irritable, then cod-liver oil does harm by still further disordering it. In phthisis the key of the situation is the state of the alimentary tract, and the giving of food and medicine must always have in view the maintenance of this tract at its healthiest.

In the chronic, or non-febrile forms of phthisis, cod-liver oil is generally well borne, and does great good; but, as in the case of the more acute varieties, it sometimes upsets the stomach. It is generally held that diarrhœa in phthisis is a decisive contra-indication to the employment of the oil, but this is only partly true. Cod-liver oil, no doubt, increases sometimes the diarrhœa, but this arises chiefly when the dose is unduly large, or too frequently administered, and if a teaspoonful only is given at a dose, once or twice a day, the oil may even control the diarrhœa. In cases of phthisis with diarrhœa it is a good plan to begin the cod-liver oil cautiously in small dose, and if it suits it may then be given with greater freedom. An excellent method is to give a teaspoonful the last thing at night, immediately before sleep, at which time it may often be borne without producing either nausea or diarrhœa, though previously it had occasioned one or both of these symptoms.

In the early stage, as might be expected, phthisis is most benefited by the use of oils.

Phlegmatic persons with sallow skins and dark complexions benefit more, it is said, by cod-liver oil than persons of sanguine temperament and florid complexion.

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[1] In general, wherever mentioned, the terms scrofulous and strumo
be understood as synonymous with tuberculous.

Cod-liver oil is often very serviceable in chronic rheumatism, rheumatoid arthritis, chronic gout, chronic skin affections, syphilitic or otherwise. It is also particularly useful in emphysema of the lungs, and in chronic bronchitis, in the former checking lung degeneration, in the latter controlling the expectoration.

Many persons, especially the aged, complain of much sinking, or of a sensation of "craving" at the epigastrium, relieved for a short time only by food, a condition sometimes connected with atonic dyspepsia, sometimes dependent on the general state of health. If the intestinal canal is not in an irritable condition, cod-liver oil will remedy this sinking. Middle-aged patients suffering from that anomalous group of symptoms called hysteria complain sometimes of the same irksome symptoms. In this case oil will remove the sinking, while it often, simultaneously, relieves the other symptoms of the group.

Cod-liver oil and quinine is the best treatment for giddiness in the aged, that is, when this symptom is not ascribable to serious organic brain disease, but is probably due to atheromatous changes in the brain-vessels, or to a weak heart. Indeed, cod-liver oil, since it promotes nutrition, is highly useful in the sufferings due to old age.

Fats are of special use in the chronic diseases of children, arising from mal-nutrition.

Cod-liver oil often modifies favourably the course of laryngismus stridulus, rickets, chorea, the middle and after-stages of whooping-cough, and chronic coughs.

The obstinate constipation of children sometimes yields to cod-liver oil.

The chronic diarrhœa manifested by a few pale, pulpy, stinking motions daily, will often reduce a child of a few months old almost to a skeleton. The skin becomes leathery and wrinkled, food is, perhaps, rejected, and, when things are brought to this dangerous pass, thrush breaks out. While combating the diarrhœa or vomiting, a teaspoonful, or half a teaspoonful of cod-liver oil, given to the child nightly before sleep, gradually increasing the quantity and frequency of the dose, will neither increase the vomiting nor the diarrhœa, but, on the contrary, promote nourishment and growth, improve the general health and rescue the patient from a perilous condition.

Hitherto, fats have been spoken of, for the most part, in common, but they certainly are not all equally useful therapeutic agents.

As we have seen, animal fats are to be preferred to vegetable fats; among the former liver fats are generally esteemed beyond all others. Whether cod-liver oil is superior to that derived from the livers of other animals is difficult to decide, since much of the cod-liver oil of commerce is procured, not only from the livers of various fish, but likewise, it is said, from those of other marine animals.

The superiority of cod-liver oil has been thought to depend on the minute quantities of iodine, phosphorus, or bile which it contains—

a conjecture clearly wrong, for the effect of these substances in disease is dissimilar to that of the oil.[1]

The superiority of liver oils is ascribable to their easy toleration by the stomach. They can generally be taken without inconvenience for months or years, while other fats and oils often produce nausea, loss of appetite, and diarrhoea.

Cod-liver oil often excites at first nausea, vomiting, and disagreeable eructations. Occasionally the difficulty in overcoming the distaste for this medicine is almost insuperable, yet disgust is generally overcome, and in a short time the oil may be taken with relish even, and, indeed, children often come to regard the dose as a treat. Sometimes at the commencement of the course a child becomes languid, loses appetite and appears worse, but usually, after a week or ten days, the oil begins to be tolerated and then improvement sets in.

The nausea and vomiting sometimes caused by this remedy may be produced by too large a dose. To begin with a teaspoonful or even less, is enough: and should the stomach manifest intolerance, one dose only should be given daily: and it is a good practice to give this at night-time, just before lying down to sleep.

Cod-liver oil is often administered in such quantities that it can scarcely be borne, even when the stomach is accustomed to it. Weeks, and even months, may elapse before full doses of oil can be digested and absorbed: and hence, if swallowed in undue bulk, it will merely pass off in the motions, and by its decomposition may disorder the intestines. An examination of the motions will show whether the oil is given in excess.

Cod-liver oil should be taken after food, on orange or ginger-wine, or with a small dose of brandy-and-water in the proportion of equal parts, or of one part of brandy to two of water, or some agreeable tincture of orange-peel, and it should be so poured as not to touch the glass, but to float on the surface of the wine or the brandy as a globule, and thus tossed off, without allowing the teeth to be touched. A little salt taken immediately before and after the dose often removes the taste, and prevents nausea, and it is said that a few drops of ketchup added to the oil will cover its taste.

A mixture composed of equal parts of cod-liver oil and fresh mucilage of gum acacia and water has very little taste, and the addition of two minims of oil of lemons to each ounce of this mixture conceals effectually the fishy flavour.

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[1] Recent investigations tend to show that the special value of cod-liver oil resides, not in the small percentage of iodine, phosphorus and other, so to speak, extraneous bodies, but in the main body of the oil, in the character, *i.e.*, of the fats. These, according to Heyerdahl, are quite different from other fats, and in one respect especially, viz., the tendency of the free fatty a present to oxidize. (*Cod-liver Oil and its Chemistry*, Peckel Möller.)

A cod-liver oil jelly has recently been prepared, which is said to contain 70 per cent. of oil. Bolted like jelly it is almost tasteless.

Notwithstanding these ingenious devices, it is not uncommon to meet with patients who, even after repeated trials, cannot tolerate the oil on account of the eructations, loss of appetite, nausea, or vomiting which follow. In some cases this intolerance is due to dyspepsia; but it is generally due to an inability to digest and absorb fat, such as is so commonly noticed in consumption, even before its active development. This fact has been much dwelt on by Dr. Balthazar Foster, who, led by some suggestive experiments of Claude Bernard—in the case of patients intolerant of oil—uses ether as a means of assisting the digestion and absorption of fat.

Claude Bernard has shown that the action of ether "is twofold—(1) it stimulates the pancreas and glands of the duodenum to pour out their secretions freely, and (2) at the same time facilitates the absorption of those very substances which these secretions are designed to digest. In other words, ether not only obtains for us the secretions required to digest, but promotes the absorption of these fats when digested." Bernard maintains that fats are chiefly absorbed by means of these secretions. After a prolonged investigation of the influence of ether, Dr. Balthazar Foster finds that oils and fats, which otherwise cause nausea and sickness, are, by means of this combination, retained and digested, whilst at the same time the appetite is retained; under these circumstances nutrition and weight increase. Dr. Foster employs the æther purus of the Pharmacopœia in doses of from ten to fifteen minims to every two drachms of oil. The ether may be given either separately, or with the oil; but as the ether masks the unsavouriness of the oil, it is better to combine them. Cod-liver oil may be given in capsules.

Numerous other combinations are made with cod-liver oil; among the more important are combinations of extract of malt with cod-liver oil; these are much used, and, in general, are well tolerated. The amount of oil incorporated varies a good deal, it should be at least 15 per cent.: two or more drachms are given for a dose.

Beechwood creasote is miscible with cod-liver oil, also guaiacol, an important constituent of this creasote; either may be added to cod-liver oil in the proportion of one, two, three or more minims to the drachm of oil.[1] This combination is useful in the treatment of phthisis. (*See* Creasote.)

Lime-water mixed with the oil sometimes obviates the nausea, and even the diarrhœa induced by the ingestion of cod-liver oil.

Fats are consumed in the body, but sometimes a small quantity escapes with the fæces and urine. The quantity escaping by the urine is insignificant, except in the disease called chylous urine, in which fat is often present in considerable amount. In Bright's disease a little fat is voided with the uriniferous casts in the urine.

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[1] Much depends upon the purity of the creasote, as to the dose of it which can be given.

CASTOR OIL, CROTON OIL

THESE oils consist of a bland oil, with a variable quantity of an acrid, irritating, purgative matter, which imparts to them their characteristic properties. This irritating substance exists in small proportion in castor oil, and in larger proportion in croton oil. Croton oil irritates the skin, producing redness, vesication, and, in concentration, even pustulation; this will be followed by scars. The admixture of alkalies increases the irritating effect; hence, liquor potassæ is sometimes added, to intensify the effects of croton oil.

The action of croton oil is very variable; several applications on successive days may produce but slight vesication, whilst sometimes a single moderate application may set up great irritation, much vesication, and even pustulation. Caution is therefore needful. When applied too energetically or too persistently, croton oil liniment ends in producing superficial papilliform white rounded scars, with a hair follicle in the centre of each. These scars gradually disappear. Croton oil liniment applied to the chest of phthisical and bronchitic patients is highly esteemed as a counter-irritant, but, owing to the vesication it produces, it cannot generally be repeated more than once or twice on successive days, and sometimes only one application can be borne. In bronchitis and phthisis croton oil liniment is sometimes preferred to mustard poultices, and, indeed, certain patients aver that croton oil gives them greater relief than mustard poultices. The vesication, being a decided disadvantage, the patient must carefully avoid conveying any of the application to tender parts of the skin, such as the face or the scrotum, lest it should provoke troublesome or severe inflammation. Dr. Tilbury Fox states that croton oil produces sometimes a symmetrical erythema of the face, lasting for a few days, in cases where no direct application of the drug could have occurred, and I too have seen this erythema of the face occur during the employment of croton oil. It is hard to say whether this erythema depends on the action of the croton oil after its absorption into the blood, or upon any volatile acrid principle, reaching the face through the air, or simply by means of the oil conveyed by the hands.

As is the case sometimes with iodine liniment, and now and then with a belladonna plaster, I have known croton oil liniment produce a crop of itching papules which have spread over the chief part of the body, reaching even to the feet.

Dr. Aldersmith employs croton oil as an application in obstina ringworm. He says: "I generally put it on a patch about the size of a shilling, with a small camel's-hair brush, and order a poultice to be applied at night; then, if it has not set up severe inflammation and pustulation by the next day, which is very rare, I apply it again, keeping poultices on constantly day and night. A pustular rash occurs at once, but the oil can be applied over this, and a daily application of it for three, six, or ten days, together with constant bathing with warm water, and frequent poulticing with linseed meal, will generally set up such inflammatory exudation that the patch resembles true kerion." Dr. Thin draws attention to the risk of this treatment causing permanent baldness.

Locally, castor oil exerts scarcely any action when applied to the skin; indeed, it is even used as an emollient to the conjunctiva, in cases of local irritation, allaying for instance the pain and intolerance of light caused by a foreign body, such as sand or grit. The daily application of castor oil is, however, reputed to remove warts in a month or six weeks; this would suggest something more than a mere emollient action.

Croton oil has an acrid burning taste. Pure castor oil is almost tasteless. This perhaps is a euphemism.

These oils, apart from their acrid principle, behave in the stomach and intestines, for the most part, like other oils, and if not quickly expelled from the intestines they become absorbed into the blood, and serve the same purpose as other oils. In large dose croton oil will cause inflammation of the stomach.

The acrid matter of these oils, irritating the mucous membrane of the intestine, excites slight catarrh, and by this means purges. As alkalies intensify the action of the acrid principle, the purgative effect of these oils is heightened by admixture with the alkali of the bile and other alkaline secretions.

These oils, especially castor oil, are commonly used as purgatives. Castor oil is a speedy, certain, and somewhat mild purgative, producing only one, two, or three motions, with little griping. It is said to purge when injected into the veins, or even when applied to the skin, and if this statement is true, the oil must have an especial affinity for the intestines. It is commonly used as a purgative for children, for women in pregnancy, and after parturition, in cases of fever, also in piles, and in fissure of the anus. It is not a good purgative in habitual constipation, since it increases the torpid habit of the bowels, an effect frequently witnessed in children.

Dr. Soper recommends castor oil and glycerine in equal parts, and he finds that with this combination half a drachm of the oil is sufficient. The oil must be added slowly to the glycerine in a mortar, and the mixture well rubbed together. The taste of the oil is thus covered.

Croton oil is a powerful purgative, producing watery stools, with much depression. It is an uncertain purgative, sometimes acting in half an hour, at other times requiring much longer, sometimes acting in small dose, at other times large quantities, even six or eight drops, being required. It is hence seldom used, unless, as in apoplexy, coma, and mania, it is important to administer a purgative of small bulk. It is sometimes employed in obstinate constipation when other purgatives have failed. It is a good plan to give a quarter or a third of a minim every hour, for by this means a much smaller total quantity will often succeed better than a larger quantity given in one dose. Owing to its acrid taste it is generally administered in the form of a pill, but in the case of patients in a state of insensibility, it should be mixed with a little butter or lard, and conveyed to the back of the tongue, when it is swallowed involuntarily, or trickles down the throat.

From experimental evidence, Röhrig is led to conclude that croton oil given to fasting animals is a powerful stimulant to the liver, but Rutherford and Vignal did not get this result in their experiments.

As these oils remain but a short time in the intestines, the greater part passes out with the motions. Probably but little of the acrid matter passes into the blood, since, unless croton oil is swallowed in large quantity, those serious symptoms, seen after its injection into the veins, do not occur.

Like other purgatives, these oils may influence distant organs, such as the kidneys, and act as diuretics.

Croton oil has been used in hydrocephalus, and it is said to have removed the excess of fluid from the ventricles of the brain.

Diarrhœa, in children, often yields to eight or ten drops of castor oil suspended in mucilage; but, unfortunately, the indications for this treatment being unknown, it often fails. A castor-oil mixture of this kind is, however, present in most children's hospital pharmacopœias, and is of great value.

In the early stages of diarrhœa it is a common practice to administer a dose of castor oil, to carry away the irritant exciting the discharges. This, or a full dose of Gregory's powder, is an excellent treatment prior to the use of astringents.

Castor oil may be taken almost if not quite tastelessly in beef-tea, highly-peppered and well salted; or the oil may be beaten up with an equal quantity of the froth of porter, and tossed off before the constituents have separated. A mixture consisting of castor oil, half an ounce, fresh mucilage of acacia, three drachms, distilled water, five drachms, has very little taste. It may be flavoured with oil of peppermint or oil of lemons. It is a good plan to pour into a wetted glass the required dose, and then toss it off without letting the oil impinge upon the teeth.

The oil may be taken conveniently in small dose, one or two drachms enclosed in capsules, each containing one half to one drachm. For occasional use a full dose of oil, one half to one ounce, is required, but for continued use, a teaspoonful once or twice a day, night and morning, is often sufficient. Such small dose may also be conveniently administered on tincture of orange peel as in the case of cod-liver oil.

GLYCERINE

This substance possesses certain valuable physical properties: its thick syrupy consistence, and hygroscopic powers, enable it to adhere to surfaces to which it is applied and to keep them in a moist state, since at the same time that it attracts and holds water it does not tend itself to evaporate. It dissolves many substances and is miscible with many others, hence it is capable of acting as a vehicle for numberless active principles.

Its applications are endless. It is antiseptic, and preserves lymph vaccine indefinitely. It is a useful application for chapped lips and hands, and for the rough furfuraceous and inelastic skin, left after eczema, or other skin complaints. It restores suppleness to the tissues, and allays burning, tingling, and smarting. Undiluted glycerine may itself cause inflammation and smarting, hence it should be mixed with an equal quantity of rose-water or eau de Cologne. Glycerine of starch acts still better in rendering the skin soft and supple. In xeroderma a bath should be taken daily, and some glycerine preparation rubbed in after wiping the body thoroughly dry. Glycerine is a good application for dryness of the meatus of the ear, and when the tympanum is ruptured, it covers the opening in the tympanum with a thin film, supplying for a time the place of the lost membrane.

Dr. M. Rosenthal recommends glycerine as a solvent for alkaloids employed hypodermically. One drachm of glycerine will dissolve ten grains of muriate of morphine, twenty grains of sulphate of quinine, but only one grain of curare.

The lips, tongue, and gums, when dry and coated with dried mucus, as in acute diseases, should be washed and kept moist several times a day with glycerine; this greatly improves the comfort and appearance of the patient. If the sweet taste of glycerine is unpleasant, it will answer as well if diluted with an equal quantity of water or lemon-juice. An occasional sip of this is also useful in the discomfort of dry throat.

In the last stage of chronic disease, as in phthisis, when the mucous membrane of the mouth becomes dry, red, shiny, and glazed, a condition causing much distress, and usually accompanied by great thirst, a wash of glycerine and water, to rinse the mouth, will relieve the harassing condition. Undiluted, glycerine is apt to make the mouth clammy and sticky. Glycerine will sometimes cure thrush. Glycerine of borax is useful in aphthæ and in thrush, likewise a saturated solution of boric acid in glycerine, which latter, indeed, is an excellent antiseptic. (*See* Boric acid.)

Glycerine of borax is a good application in pityriasis of the scalp.

Glycerine of carbolic acid is a useful application to fœtid sores and open cancers of the surface of the body, or of the uterus. It removes the offensive odour of the discharge, and improves the condition of the sore.

A pledget of cotton wool, saturated with glycerine, and applied for several hours to the congested neck of the womb, will induce a copious serous discharge, and will give as much relief as the application of leeches. The pledget should be fastened with a piece of twine, so that the patient, herself, can readily withdraw it. The glycerine may be variously medicated, *e.g.* with ichthyol in varying strength up to thirty or fifty per cent.

Glycerine is much used now in the manufacture of medicated pessaries and suppositories. A drachm of glycerine injected into the rectum is useful to relieve the bowels in constipation.

One of the best preventives of bed-sores is glycerine or glycerine cream. The part exposed to pressure should be washed morning and evening with tepid water, and carefully dabbed quite dry with a soft towel, and then gently rubbed over with a little glycerine or glycerine cream. If the skin is sore or tender the glycerine cream is best. A draw-sheet made of linen, and sufficiently large to be firmly tucked in at both sides of the bed (as any folds or creases are very apt to produce tenderness, and eventually sores), will prevent any soiling of the bed-clothes. This preventive treatment by glycerine applications should be commenced before the on-coming of redness or tenderness.

Glycerine has been used in place of sugar, as in diabetes, but saccharine is far preferable. It has also been recommended as a substitute for cod-liver oil, but experience has shown its inferiority.

Glycerine I find useful in stomach flatulence and in acidity; one to two drachms should be taken several times a day in tea, coffee, or water, with food.

A teaspoonful of glycerine taken neat, or added to water, is often useful in coughs, even in the cough of phthisis. It may be added to a little lemon-juice, which, in some cases, makes it more efficacious. This taken at night often lessens morning cough. A very large dose of glycerine injected subcutaneously in animals may produce, among other symptoms, hæmoglobinuria, from destruction of the red corpuscles. Large doses by the mouth are laxative in man. A certain amount of the glycerine swallowed is absorbed, and, it would appear, is burnt in the tissues: to some extent therefore it will act the part of a food.

LANOLINE

In contradistinction to the group of the ordinary or glycerine fats, lanoline is a cholesterin fat, *i.e.* a compound of cholesterin with a fatty acid. It may be regarded, perhaps, as a waste product of metabolism, but it serves as a natural lubricant of the skin. The lanoline of commerce is obtained from sheep's wool. It differs from glycerine fats in two important properties: (1) the readiness with which it is absorbed by the skin; (2) its power of taking up water; further, it is chemically very stable, *i.e.* is not prone to become rancid. Lanoline, moreover, does not irritate the skin. The ordinary lanoline in use is the pure wool fat partially hydrated, the adeps lanæ hydrosus of the B.P.

On account of its power of absorbing water, lanoline is very useful as an application to moist surfaces, *e.g.* the mucous membranes. The one objection to its use, as an ointment, its stickiness, is overcome by mixing it with liquid paraffin or with vaseline. The unguentum lanolini consists of two parts of lanoline and one part of vaseline. (*See* Helbing, *Modern Materia Medica.*)

The special indication for the use of lanoline, in preference to other fats, is to be found in those cases where we desire to introduce by absorption some active ingredient; but on account of its non-irritant nature and its stability, it finds a much wider sphere of usefulness than this purpose would cover, and it may, in a majority of cases, displace with advantage the ordinary fatty ointments.

"In the manufacture of the so-called 'superfatted soaps,' a good many manufacturers now use lanoline as the most suitable form of adding the excess of fat." (Helbing.)

THE GROUP OF THE PARAFFINS—HARD PARAFFIN, SOFT PARAFFIN (VASELINE), Etc.

These bodies are all of the nature of hydrocarbons. They vary greatly in consistence from a hard, waxlike firmness, through a soft buttery condition, as in vaseline, down to fluidity of a thin oil. Though keeping to a considerable extent the outward characteristics of fats and fatty oils, these substances differ greatly in their chemical structure. They are by nature incapable of saponification, and of undergoing the change known as rancidity, to which fats are prone. They are not readily absorbed by the skin, and in this respect come far behind ordinary fats.

For lubricating and emollient purposes, members of this group do excellent service, also as a means of coating and protecting surfaces; but where they act as vehicles for a medicament, which is to be absorbed, they are less useful. Mr. Martindale has suggested the advisability of increasing the consistence of ordinary vaseline by incorporating in it a proportion of hard paraffin; a better ointment basis is thus secured. He advises the admixture of two parts of soft paraffin with one part of hard paraffin.

The more liquid paraffins, such as oil vaseline, oleum deelinæ, paroleine, glymol, adepsine oil, etc., are very useful as solvents of medicaments for hypodermic injections, for pigments, and for sprays for the throat and nose. (*See* Martindale's *Extra Pharmacopæia.*)

Since vaseline, or some admixture of paraffins of similar consistence, remains unchanged by exposure to the air, it is highly useful for lubricating the skin when it is dry or hard, as in psoriasis, chronic eczema, xeroderma, chapped hands, sunburn. It is excellent in many cases of chronic eczema where the skin is dry and scaly. The oleum deelinæ I have found very useful in similar cases.

As it is not absorbed by the skin, it is not the best vehicle for medicines like aconitia, veratria, etc., but it may be used with advantage to incorporate those substances such as lead, mercury, zinc and iodide of sulphur, which make lard rancid.

Petroleum (petroleum ether, U.S.P.) and benzin are popularly used as local applications in chronic rheumatism, and appear to be of considerable service.

Some of the liquid members of this series are used internally—the hypophosphites may be given thus in emulsion. The petroleum basis appears to be very bland and indifferent. Whether it is to any extent absorbed and utilized in the tissues is not known.

TANNIN AND ITS COMPOUNDS; GALLIC ACID

TANNIC acid is contained in a number of vegetable preparations, and constitutes, indeed, the astringent principle of plants. These substances produce little or no change on the unbroken skin, but act as astringents to sores and mucous membranes, checking secretion by contracting the vessels and condensing the tissues. Rossbach, however, maintains that the vessels are dilated but not paralysed, for they contract on stimulation. They precipitate albumen, and thus coat the surface of wounds, in some measure protecting them from the injurious action of the air; tannin-containing substances are hence applied to excoriations, profusely discharging sores, and luxuriant granulations.

Tannin is conveniently employed in the form of glycerine of tannin. This preparation is useful in ozæna, also in certain conditions seen after measles, scarlet fever, and some other diseases, in which the inside of the nose becomes excoriated and reddened, and discharges freely a thin sanious or a thicker purulent fluid, which, on drying, scabs up the nose, and often excites eczema of the upper lip. If here the inside of the nose is well brushed out with glycerine of tannin, the discharge will cease, even after a single application; but if the scabs are thick, they must first be thoroughly removed, so as to enable the application to act on the sore-secreting surface. Glycerine of tannin is useful in the syphilitic ozæna of children; it arrests the discharge, reduces the swelling of the mucous membrane which produces the characteristic snuffling, and, by enabling the child to breathe through the nose, permits of sound refreshing sleep, and, in infants at the breast, it renders suckling possible.

Occasionally among adults we meet with an impetiginous eruption of the inside of the nose, most severe near the orifice where the hairs grow, but extending higher in a milder form. Scabs block up the nose, especially at night, and the alæ, and sometimes the whole of the nose is thickened, dusky red, and very painful. The swelling may extend to the adjacent structures, and may result in repeated attacks of erysipelas of the face. Glycerine of tannin, applied once or twice daily to the whole cavity of the nose, speedily reduces and even cures this disease. The upper part of the nose is the most easily cured, but the disease situated in the hairy part is much more obstinate, and is very prone to recur again and again. In obstinate cases epilation is useful. Glycerine of starch or zinc ointment, applied several times a day, keeps the tissues moist and supple, and is a serviceable supplementary application.

Glycerine of tannin will generally check the nasal discharge of thick, lumpy, greenish-black, and stinking mucus, which is sometimes met with, and, even when it fails, it, as a rule, removes the offensive smell. In other forms of ozæna, especially when the disease affects the upper and back part of the nose, with its numerous recesses, it is preferable to flush the nose with a deodorizing and astringent lotion, which, besides benefiting the mucous membrane, washes away the inspissated and putrefying discharge on which the stench of ozæna generally depends.

Glycerine of tannin is very valuable in otorrhœa, a common complaint of weak, unhealthy children after severe illnesses. The external meatus must be filled with it, and the fluid retained there by cotton-wool. One application usually suffices, but a slight discharge may remain, or return in a few weeks, in which case a repetition of the treatment is called for. This treatment is inapplicable in the more acute stages of inflammation of the meatus. Otorrhœa is much more difficult to cure when the tympanum is destroyed and the small bones are exposed; indeed, in such cases, the tannin does but restrain and deodorize the discharge, which generally returns when the application is stopped.

An injection of glycerine of tannin is very beneficial in the after-stages of gonorrhœa, and in gleet, but, as the undiluted preparation commonly excites much pain, it should be mixed with an equal quantity of olive oil or mucilage. Two drachms of this mixture is enough for each injection, for too much will excite frequent and painful micturition; the discharge in many instances ceases only during its employment. Urethral injections should be persevered with for eight or ten days after the cessation of the discharge, and as they are apt to excite seminal emissions, should not be employed at bed-time.

Tannin, either alone or blended with other astringents, is a useful injection in leucorrhœa. In obstinate cases, and when the os uteri is ulcerated, a suppository of tannin and cocoa-nut fat applied to the mouth of the uterus is very beneficial. Glycerine of tannin checks the abundant discharge of cancer of the uterus, and destroys the stench, but a mixture of glycerine of tannin and glycerine of carbolic acid is still more useful.

Glycerine of tannin will often cure the chronic vaginitis of children, a complaint generally more obstinate than either ozæna or otorrhœa.

Glycerine of tannin is useful in some stages of eczema; thus, after the removal of the scales, if the inflamed, red, swollen, and weeping surface is painted with this preparation, it will notably abate the discharge, redness, heat, and swelling. A poultice must be applied at night, and if the glycerine of tannin excites much pain the poultices must be continued both night and day. In a less active stage, when the tissues are not so red, swollen, and weeping, eczema yields still more readily to the glycerine of tannin, applied twice or thrice daily: at this stage a poultice at night is still useful. Tannin glycerine allays quickly the troublesome itching, tingling, and burning, so common in eczema; hence it prevents the tearing with the nails and the rubbing, which hinder healing, nay, even cause the eczema to spread. It may not, however, entirely remove the disease, but only reduce it to the desquamative stage, with a tendency to crack and ooze; at this point tar, carbolic acid, or other ointments become necessary to complete the cure. The same treatment is useful in impetigo. A poultice must be applied each night to remove the scabs, and the tannin application employed during the day. While treating these skin diseases, the state of the digestive organs must not be overlooked.

Eczema of the ears, common in middle-aged and old people, yields readily to the glycerine of tannin, unless the inflammation runs high, with great swelling, heat, and weeping. This remedy is also very efficacious in the eczema of children, occurring behind the ears, one or two applications speedily drying up and healing the affection although it may have lasted for weeks or months. At the sa the gums must be lanced, if they are red and swollen, and any other irritations removed.

Glycerine of tannin sometimes benefits intertrigo.

The following is an excellent pomatum for dandriff:—Tannic acid, ʒj.; glycerine, ʒss.; balsam of Peru, 20 drops; oil of bitter almonds, 4 drops; prepared lard, ℥j.

Few applications are so useful in irritable piles as gallic-acid and opium ointment. This combination quickly relieves the pain, and after a time even reduces the size of the hæmorrhoidal tumours. Calomel ointment, also, is highly useful.

Equal parts of tincture of catechu (the active principle of which is tannic acid) and liquor plumbi is a useful application to prevent bed sores.

Glycerine of tannin is useful in ulcerative stomatitis, especially in that form affecting the edges of the gums only; but dried alum is a better application. (*See* Salicine.)

Glycerine of tannin is very useful in many throat diseases. Immediately after acute inflammation has passed, when the mucous membrane begins to grow less red, less swollen, more moist, and is covered with mucus or pus, glycerine of tannin painted on the pharynx hastens recovery, prevents the chronic inflammation attended by relaxation of the mucous membrane, which often follows the acute disease, heals superficial ulcerations, occurring as the acute inflammation subsides, and cures hoarseness. It causes dryness of the mouth and lessens the sensitiveness of the nerves, both of ordinary and special sensation.

Glycerine of tannin is useful on the appearance of ulceration in aphthous sore throat. In chronic inflammation of the throat when the mucous membrane is relaxed, swollen, granular-looking, and covered with mucus or pus, a few applications of the glycerine of tannin will brace up the tissues and lessen or remove the hoarseness. This kind of throat, often with slight enlargement of the tonsils, is common in children, and sometimes produces deafness, and still more often a frequent hacking cough, which may keep the child awake the greater part of the night. In children this is so commonly the cause of cough that when this symptom is complained of it is always well t examine the throat. Glycerine of tannin applied daily in such ca speedily allays the cough, and cures the deafness. Throat deafness the most common form of deafness in childhood; and when not d to enlarged tonsils, generally depends upon the kind of morbid thro just described. With it is frequently associated an overgrowth lymphoid tissue above the soft palate, at the back of the nares, the called adenoids. Such patients speak with flat voice, and they breat through the open mouth, the nose being blocked. In all cases of thro deafness it is essential to discover whether adenoids are present an may be considered the sufficient cause; if so, surgical interferen will probably be needed.

Many coughs depend on the state of the throat: a fact accepted in theory, but little regarded in practice. Glycerine of tannin is very useful to allay the cough and frequent deglutition excited by an elongated uvula, and also to soothe the frequent hacking cough in phthisis, when due to inflammation or ulceration of the throat. A good night's rest may often be obtained by painting the throat with this preparation shortly before bedtime, and a small quantity of morphia added to the glycerine of tannin will be found to increase the soothing effect. Mopping the pharynx, epiglottis, and adjacent structures with this application will much reduce the frequency and violence of the paroxysms of whooping-cough. It is of little use if the case is complicated with catarrhal, or other, inflammation of the lungs, with tuberculosis, or any irritation, as that of teething; but in simple uncomplicated whooping-cough it is very useful. The paroxysmal cough often left by whooping-cough, and which readily returns each time on catching cold, yields to this treatment. In whooping-cough and the foregoing throat diseases, glycerine of tannin is better indeed than a solution of nitrate of silver, as it excites less pain, and is less disagreeable to the taste. (*See* Nitrate of Silver.) Glycerine of tannin is more efficacious than are tannin lozenges.

Krameria (Rhatany) acts as an astringent by virtue of its tannic acid; lozenges made from the extract are excellent in relaxed states of the throat, and they are said to interfere less with digestion than tannic acid pure and simple. In irritable states of the throat a small dose of cocaine, $\frac{1}{20}$ to $\frac{1}{10}$ of a grain, may be combined in the lozenge, each lozenge to contain three grains of the extract of rhatany. (See *Throat Hospital Pharmacopœia.*)

In diphtheria and croup, Trousseau successfully employed several times a day, for fifteen or twenty minutes, a solution containing five per cent. of tannin, in the form of spray. The treatment in diphtheria should, however, be more actively antiseptic and more frequently applied. (*See* Boric acid and Chlorine.)

Tannin unites with albuminous matter in the stomach, forming an insoluble substance, and any tannin left uncombined constringes the mucous membrane, and lessens its secretions. As tannin likewise diminishes the solvent power of the gastric juice, it is inadvisable to give tannin-containing substances close to meal-times.

It is asserted that tannin, by virtue of its astringency, cures slight catarrh of the stomach, and hence tannin preparations have occasionally been employed in irritative dyspepsia. Some give tannin for pyrosis, but they do not inform us whether it checks neutral, alkaline, or acid pyrosis, or all these forms of the complaint. In poisoning by alkaloids, such as strychnine and morphine, tannin is given to precipitate them. Tannin controls bleeding from the stomach; it should be given in large doses, gr. 10 to gr. 20. The members of this group are astringent to the intestines, lessening their secretions and probably opium ointment. This combination quickly relieves the after a time even reduces the size of the hæmorrhoidal Calomel ointment, also, is highly useful.

Equal parts of tincture of catechu (the active principl is tannic acid) and liquor plumbi is a useful application to pr sores.

Glycerine of tannin is useful in ulcerative stomatitis, esp that form affecting the edges of the gums only; but dried better application. (*See* Salicine.)

Glycerine of tannin is very useful in many throat diseases. ately after acute inflammation has passed, when the mucous begins to grow less red, less swollen, more moist, and is co mucus or pus, glycerine of tannin painted on the pharyn recovery, prevents the chronic inflammation attended by of the mucous membrane, which often follows the acute dis superficial ulcerations, occurring as the acute inflammation and cures hoarseness. It causes dryness of the mouth a the sensitiveness of the nerves, both of ordinary and special

Glycerine of tannin is useful on the appearance of ulc aphthous sore throat. In chronic inflammation of the th the mucous membrane is relaxed, swollen, granular-loo covered with mucus or pus, a few applications of the gl tannin will brace up the tissues and lessen or remove the This kind of throat, often with slight enlargement of the common in children, and sometimes produces deafness, and often a frequent hacking cough, which may keep the child greater part of the night. In children this is so commonly of cough that when this symptom is complained of it is alw examine the throat. Glycerine of tannin applied daily in any coughs depend on the state of the throat: a fact accepted in ry, but little regarded in practice. Glycerine of tannin is very ul to allay the cough and frequent deglutition excited by an gated uvula, and also to soothe the frequent hacking cough in hisis, when due to inflammation or ulceration of the throat. A d night's rest may often be obtained by painting the throat with s preparation shortly before bedtime, and a small quantity of rphia added to the glycerine of tannin will be found to increase e soothing effect. Mopping the pharynx, epiglottis, and adjacent ructures with this application will much reduce the frequency and olence of the paroxysms of whooping-cough. It is of little use if the ase is complicated with catarrhal, or other, inflammation of the lungs, with tuberculosis, or any irritation, as that of teething; but in simple uncomplicated whooping-cough it is very useful. The paroxysmal cough often left by whooping-cough, and which readily returns each time on catching cold, yields to this treatment. In whooping-cough and the foregoing throat diseases, glycerine of tannin is better indeed than a solution of nitrate of silver, as it excites less pain, and is less disagreeable to the taste. (*See* Nitrate of Silver.) Glycerine of tannin is more efficacious than are tannin lozenges.

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Owing to their low diffusion-power, the members of this group must pass but slowly from the intestines into the blood. After, if not before, absorption into the circulation, they must become neutralised with albumen, and for this reason some authorities maintain that tannin and its allies cannot act as astringents to organs distant from the intestines.[1] Nevertheless, tannin and gallic acid are frequently employed with considerable benefit to check bleeding from the lungs, uterus, and kidneys. For topical action on the digestive mucous membrane tannin is best, but gallic acid is best to influence distant organs. Bartholow states that it is especially useful in bleeding from the kidneys, and that it is less beneficial in checking an over-abundant secretion of milk, or a profuse sweating.

Tannin is sometimes administered to diminish the loss of albumen in chronic Bright's disease, and George Lewald has experimentally tested its power in this respect. In a few carefully-conducted experiments he found that the albumen was always lessened, the daily average diminution amounting to about 0·66 grammes. Tannin produced a much more decided increase in the quantity of urine. It must, however, stand, by general consent, that we possess no drug upon which we can rely as a means of controlling albuminuria. The symptom must be attacked in its causal conditions.

The effect of the members of this group on the natural constituents of the urine is unknown. Gallic acid "passes unchanged into the urine, and has been detected one hour after being taken." Tannic acid "passes off by the urine in the forms of gallic and pyrogallic acids, perhaps of a saccharine body "[2] (Parkes).

A substance called Tannigen has been recently introduced into medicine; it is obtained by the action of acetic acid on tannin, and is known chemically as diacetyl tannin. It is a yellowish-grey, tasteless, odourless powder, slightly hygroscopic, dissolves readily in dilute alkaline solutions, but is insoluble in cold water and dilute acids.

This compound is supposed to have no effect upon the stomach if adminred during the acid state of this organ, but to become active in the alkaline tents of the intestines, and there to exert its astringent powers. *Interfer- with the functions of the stomach is thus avoided.* The drug is recommended in treatment of the diarrhœa of children and adults. The investigations of yer and Müller have been confirmed by subsequent observers.

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[1] It is, truly, difficult to see how drugs whose affinity for albumen has been saturated should act directly and effectively upon those distant parts to which they are carried by the circulation, but it is another thing if we seek for the explanation of the distant hæmostatic action in a contraction of the distant vessels by a reflex from the alimentary tract.

We may, however, have to revise our present views as to the mode of action of astringents, if it is true that the compound of tannin with albumen is as marked an astringent as that of tannin itself; this has been stated to be the case. (Helbing's *Modern Materia Medica.*)

[2] *I.e.* perhaps as glucosides.

It is prescribed best in the form of powder along with some indifferent non-groscopic substance, kaolin, for instance; the dose will vary from two to ht or sixteen grains, along with one, two or more grains of the kaolin. e powder may be given three or four times a day in milk or wine. (Merck's *nnual Report*, 1896.)

HAMAMELIS VIRGINICA, THE WITCH HAZEL

Two preparations of this plant are largely used—a tincture and a reparation called Hazeline; Pond's extract, also, owes its virtues to his plant.

Various preparations of witch hazel have long been in vogue in America among the natives, who introduced it to the English settlers.

It is used largely in hæmorrhage, and is most serviceable in passive hæmorrhage, or in bleeding (oozing) from small vessels.

Its mode of action is not clear, for though the bark contains tannin (some 8 per cent.) and the tincture is made from the bark, yet the preparation, Hazeline, which appears to be at least as active as the tincture, is a distillate and contains therefore no tannic acid. The active volatile principle of Hazeline is probably a volatile oil; the distillate, it is claimed, should be made from the green twigs of the shrub. No alkaloid is present in the plant.

Dr. Hector Guy investigated the physiological action of this useful and interesting drug, and found that it is not tonic even in very large doses, and that it has no action on the heart, arteries, or veins. Drs. Wood and Marshall, experimenting with a strong distillate, were nable to obtain any physiological effects.

Applied on lint or cotton wool, it is useful for bruises, also for ozing from wounds and sores.

In various hæmorrhages it is also very useful when taken by the tomach, and thus administered is often useful in epistaxis, hæmop-ysis, and hæmatemesis. It has been recommended in the hæmor-hagic diathesis; but in the case of a lad with this abnormality, I nployed it in vain on several occasions of nose bleeding.

It is useful in purpura, and I have seen severe cases much benefited y a drachm of the tincture given hourly, though, in most cases, half his dose is sufficient. Dr. Hall recommends it in dysentery, when he discharges contain much blood. I have known it in several cases rrest hæmaturia when other remedies had failed.

An obstinate case of bleeding from the bladder, due probably to a vascular growth, was cured by injecting, twice daily, into the bladder half an ounce of hazeline.

It is very useful, also, in some forms of menorrhagia. The dose is two drachms of hazeline twice or thrice a day. It often relieves the pain of dysmenorrhœa.

It is very valuable for piles. It rarely fails to check bleeding from piles, even when administered by the mouth, but its effect is much enhanced by injecting half a drachm to a drachm of the tincture in an ounce of cold water daily, as in the morning before rising.

It not only checks bleeding, but if this treatment is persisted in for several months it permanently relieves or even cures piles that are not very large. It has been employed successfully in varicocele, and one case I have seen in which, during the employment of the drug, the varicosities entirely and apparently permanently disappeared.

Dr. Preston extols it in phlegmasia dolens.

It is useful in catarrh of the mucous membranes, and snuffed up the nose is beneficial in colds in the head and in hay-fever.

In the earlier editions of this work I recommended one or two minims of the tincture every two or three hours, and this, in many cases, is quite sufficient to check bleeding, but much larger doses will succeed when these small quantities fail; larger doses, however, sometimes cause severe headache.

COTO BARK

This bark is said to be derived from a species of Nectandra (Helbing). Its use in certain forms of diarrhœa and in relaxed intestinal conditions associates it with the tannin group, but its composition, whilst rich in resinoid principles, shows no tannin. As in the case of Hamamelis, the action of this substance, though compassing the same end as the group of astringents, does not depend upon any albumen-precipitating body allied to the tannic acids. An alkaloid cotoin is present, and is probably the active principle.

Albertoni says of this alkaloid that it increases appetite, and that it excites an active hyperæmia of the abdominal organs. This hyperæmia depends, according to him, upon a dilatation of the arterioles, through which a freer flow of blood takes place. He holds that the use of coto in diarrhœal states depends upon this active hyperæmia, whereby an increased *absorption* from the bowel is effected.

Coto bark powder irritates the mucous membrane of the nose.

Of this plant the tincture is prescribed in ten-minim dose, the alkaloid cotoin in half-grain to two-grain dose, the powder in one to ten-grain dose, several times a day.

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Salivation is said to be checked by it, also the sweating of phthisis.

From an allied bark, paracotoin is obtained, which is used in similar cases and is employed in the same doses as cotoin.

TAR, CREASOTE, ETC.

THE members of this group are complex products of the destructive distillation of woody tissues. They contain bodies of the benzene or aromatic series, and, in particular, one or more of the phenols.

These empyreumatic oils, and their derivatives, are very useful in many chronic skin affections, such as chronic eczema, psoriasis, erythema. The odour of the oleum cadinum, or of the oleum rusci, is less disagreeable than that of tar, liquor carbonis detergens, and carbolic acid. Dr. McCall Anderson strongly recommends these oils, especially the liquor carbonis detergens, the oil of cade, and the oleum rusci. In most cases they afford immediate relief from the tormenting itching of chronic eczema, psoriasis, erythema, and prurigo, but if too long continued they excite inflammation of the hair follicles, forming papules and pustules, with a black spot in the centre of each. Hebra terms this eruption tar acne. They often excite considerable inflammation in delicate skins. The topical effect of the vapour, even, will sometimes produce acne. The parts protected by clothes escape, showing that this effect is not induced through absorption by the lungs.

These oils are useful in chronic eczema, after the subsidence of inflammation, especially when only a little redness, itching, and some desquamation remain. Sometimes pure tar succeeds better than its ointment; but if there is inflammation, or if the surface is raw and weeping, it will excite great pain and inflammation. In some instances the application of undiluted petroleum[1] much improves certain local forms of eczema, such, *e.g.*, as that kind which occurs on the back of the hands; but since this application is generally very painful, other and milder remedies should first be tried.

The external application of these remedies in psoriasis is often very serviceable. Tar, or its ointment, seldom fails to benefit chronic psoriasis, and some of the most obstinate forms of this disease may often be cured by painting the patches of the eruption with pure, undiluted tar, allowing it to remain till it wears gradually away. If the unsightliness of tar ointment is objectionable, a creasote ointment, composed of two or three parts of creasote to one part of white wax, as recommended by Mr. Squire, may be substituted. This powerful ointment must be applied only to the patch of psoriasis, not to the adjacent healthy skin, otherwise it will blister. To avoid staining exposed parts, Dr. McCall Anderson sponges the eruption in such cases three or four times daily with a wash composed of crystallized carbolic acid, two drachms; glycerine, six drachms; rectified spirits, four ounces; distilled water, one ounce. But he considers carbolic acid inferior to tarry preparations. He insists strongly on the necessity of rubbing in the ointments till they have nearly disappeared by absorption, and, lest they become rancid, of washing them off with soap and water before each fresh application.

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[1] This consists principally of the paraffins, but also contains some members of the benzene series, though in small quantity.

Petroleum soap, cade soap, and carbolic acid soap are useful in both chronic eczema and psoriasis. As these soaps are made of different strengths, if one kind prove too strong and irritating, a milder form may be substituted.

The inhalation of steam impregnated with creasote or carbolic acid, ten to twenty drops in a pint of hot water, at 140° Fah., is useful in bronchitis, lessening in some cases over-abundant expectoration. It will generally also remove the fœtor of the breath occasionally met with in bronchitis, and sometimes even the fœtor due to gangrenous lung.

Dr. Arnold Chaplin has introduced a special creasote treatment for those cases of fœtid expectoration which are met with in their worst form in bronchiectasis. The method is known as the "creasote chamber" treatment. The following details are important: the size of the chamber should not exceed 8 ft. × 8 ft. × 8 ft.; it should be filled with fumes of commercial coal tar, liberated abundantly from a flat vessel placed over a spirit lamp: the fumes should be so dense as almost to hide the opposite side of the small chamber. The patient, with eyes protected by goggles, and nose plugged with cotton wool, is placed in this chamber for 1 to 1½ hours (at the onset 30 minutes may have to be the limit). The course should last 6 to 8 weeks, with daily inhalation; subsequently it will be necessary to keep up the treatment, more or less indefinitely, by bi-weekly inhalations. Excellent results in an otherwise most intractable malady are thus obtained. The patient requires a good deal of encouragement at the first, but subsequently becomes convinced of the benefit to himself. (See *Brit. Med. Journ.*, June, 1895, and subsequently in 1897.)

The inhalation of ten drops even produces in some persons giddiness and a sensation of intoxication. The inhalation of carbolic acid with steam, or in spray, is useful in whooping-cough. Used, dry, in an oro-nasal inhaler, twice or three times a day, for a quarter of an hour to an hour each time, creasote, in five to ten minim dose, is very efficient in easing the cough of chronic phthisis and chronic bronchitis. It seems especially useful when the cough is violent and protracted, and out of all proportion to the amount of expectoration, when, indeed, the cough seems largely to depend on an excitable state of the nerves. Its effect is often rapid and complete; in fact *I know of no* remedy that affords in some cases so much and such rapid relief. I have seen it relieve the violent cough accompanying plastic bronchitis. In the use of dry inhalations the inhaler may be worn for an hour or more at a time, the patient, if otherwise able, going on with any light occupation. Every now and again a full inspiration should be taken so as to get the medicament as far as possible into the lungs.

Passing now to the alimentary tract, we note, first, that creasote, mixed either with tannin or opium, introduced into the hollow of a decayed and painful tooth, will often give relief.

A creasote or carbolic gargle or wash proves very efficacious in sloughs of the mouth or throat, removing the offensive odour, and producing a healthier action in the sore.

Small doses of creasote excite no particular symptoms in the stomach, but a large quantity produces a sensation of burning at the epigastrium, with nausea and vomiting.

During its transit through the intestines creasote appears not to undergo any change in composition, as its characteristic odour may be detected in every part of the canal. It checks the vomiting of various diseases, as that of pregnancy, sea-sickness, cancer, ulcer of the stomach, Bright's disease, and it often promptly relieves stomach pains occurring after food.

Creasote has been given in cholera and typhus fever, but apparently without much benefit.

Creasote passes into the blood, and its odour is detectable in most of the organs, showing that it probably remains in chief part, if not entirely, unaltered in the blood.

For their influence *after absorption* tar, creasote, and carbolic acid are used internally in bronchitis and in phthisis to check both the quantity of the expectoration and its offensiveness. They are especially useful in chronic bronchitis. Tar-water is an old-fashioned and approved remedy in bronchial complaints. The frequent and popular use of tar-water, both by the profession and by the laity in France and Belgium, led me, in conjunction with Dr. Murrell, to try its effects. Patients so susceptible to cold that they were obliged to remain indoors the whole winter, informed us that this remedy curtailed considerably the duration and lessened the severity of their catarrhal attacks, and that, by an occasional recourse to the tar, they became less prone to catch cold, and could more freely expose themselves to the weather.

We employed tar in two-grain doses, in pill, every three or four hours. From October to January, inclusive, we carefully watched its effects on twenty-five patients, whose ages varied from thirty-four to seventy, the average being forty-four. All these patients had suffered for several years from winter-cough, lasting the whole winter. They were out-patients, and visited the hospital weekly, or oftener. Most of them were much exposed to the weather, whilst some were so ill that they were obliged to stop work, and therefore were less exposed.

These patients suffered from the symptoms common in winter cough—paroxysmal and violent cough, the paroxysms lasting from two to ten minutes, recurring ten to twelve times a day, and in the night spoiling sleep. The expectoration, frothy and slightly purulent, was in general rather abundant, amounting in some cases to half a pint or more in the day. The breathing was very short on exertion, but most of the patients could lie down at night without being propped up. The physical signs showed a variable amount of emphysema, with sonorous and sibilant rhonchus, and occasionally a little bubbling rhonchus at the bases.

These patients usually began to improve from the fourth to the seventh day; the improvement increased rapidly, and, in about three weeks, they were well enough to be discharged. The improvement was so decided that the patients returned to their work, even those who, in previous years, had been confined to the house during the whole winter. The cough and expectoration improved before the breathing. In several cases the expectoration increased during the first three or four days, but its expulsion became easier, and with the improvement in the cough and expectoration appetite and strength returned.

On discontinuing the tar a relapse often occurred within a week or two, and the patient returned with a request for more of the same medicine, and then a second time the symptoms would quickly subside. We found the drug useful also in bronchial asthma, its effects being more evident in those cases in which expectoration and cough were more marked than dyspnœa.

We have no doubt that tar is a useful, though, perhaps, not a striking, remedy in these troublesome affections; certainly it is more efficacious than the drugs generally employed.

It may be remarked that tar is useful in the same cases for which the spray of ipecacuanha wine is serviceable. This spray, however, acts much more quickly; unlike tar, it lessens dyspnœa even before it improves cough, or diminishes expectoration.

Creasote in full doses is strongly recommended in phthisis, especially in non-febrile or only slightly feverish cases. It is said to diminish expectoration, improve appetite, and increase weight. The pure beechwood creasote is to be prescribed and the dosage should be pushed to the extent of five drops or even more for a dose, thrice daily, after meals. A good formula for its prescription is:—Creasote, two drops; compound tincture of gentian, fifteen drops; rectified spirits, twenty drops; liquid extract of liquorice, twenty drops; water to one ounce: the creasote in this mixture may be increased up to ten or even twelve drops without increasing the other ingredients. Creasote may also be administered in cod-liver oil, in the same doses; the oil incorporates it readily, so that in one drachm of oil five drops or more of creasote can be administered; or, again, it may be given in the mixture of extract of malt and cod-liver oil.

Guaiacol, the principal constituent of creasote, is often substituted for creasote, because less disagreeable and less prone to irritate the stomach; it is given in the same doses. The liability to irritate the stomach holds, however, for both of these drugs, and in all cases of their administration we should carefully watch for any signs of gastric upset, withholding the drug or lessening the dose on the arising of such.[1]

In carbonate of creasote (creasotal) and in guaiacol carbonate we possess substitutes which will probably displace completely the original uncombined drugs, for these carbonates are practically neutral to the stomach, yet liberate creasote and guaiacol for absorption. They may be given in much larger dose: creasotal up to half-drachm or drachm doses (or even more) in milk or bouillon, guaiacol carbonate in similar doses in cachet. In a series of cases which we have had at the Victoria Park Hospital the drug gave good results, and was excellently borne by the stomach, even in drachm doses.

Dr. Anderson gives tar in chronic eczema. He begins with three or four minims in treacle, pill, or capsules, gradually increasing the dose to ten or fifteen minims three times a day. In gangrene of the lungs creasote is employed internally to obviate the fœtor of the expectoration, but though as an inhalation it certainly succeeds, when swallowed it is of doubtful efficacy.

Oppression of the head, epigastric pain, vomiting of dark-coloured fluid, and black motions sometimes occur after the application of tar though rarely except when applied over a large area.

Tar and creasote are reputed to be diuretics, and, as some of the ingredients of tar pass off with the urine, changing its colour and odour, they may possibly act on the urinary tract. Thus tar, creasote, and carbolic acid, administered either internally, or applied externally, cause sometimes dark-coloured, and sometimes black, urine, which gradually becomes lighter in tint. It is said that the dark coloration of the urine occurs more frequently from the external than from the internal use of carbolic acid, and Ferrier suggests that this is owing to its becoming oxidised before its absorption. Sometimes the urine is natural in colour when first passed, but becomes dark on standing. On the addition of sulphuric acid the odour of tar is readily perceived, and chloride of iron develops a beautiful blue colour. The local application of oleum fagi, oleum rusci, oleum cadinum occasionally affects the urine in the same manner. The urinary changes are especially marked within the first few days; after a time these changes become scarcely perceptible. The discoloured urine remains clear throughout, rarely contains albumen, and does not exhibit an excess of iron, showing that the discoloration is not due to disintegrated blood corpuscles.[1] The urine, in health, contains a trace of carbolic acid. Carbolic acid and creasote sometimes excite strangury. Carbolic acid and the sulpho-carbolates administered by the stomach prevent, as we shall show, decomposition of the urine; possibly these drugs may prove useful agents to keep the urine sweet in cystitis, enlarged prostate, and paralyzed bladder.

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[1] It is claimed for some of the creasote specimens now obtainable that they are scarcely at all irritant, and may be given in much larger dose than the above quoted.

Tar and creasote are antiseptics, but this action is better instanced by carbolic acid and its derivatives; these we shall now proceed to discuss.

CARBOLIC ACID AND SULPHO-CARBOLATES

CARBOLIC ACID destroys the lowest forms of animal and vegetable life, and prevents fermentation and putrefaction. Whilst it prevents the fermentation of sugar, it is said not to prevent the conversion of starch into sugar, nor the decomposition of amygdalin by its ferment, emulsin. Dr. Brunton, however, in his work states that strong solutions will prevent these changes. It is largely employed to prevent the stenches of drains, water-closets, dissecting rooms, and hospital wards. Unlike chlorine and permanganate of potash, carbolic acid is incapable of destroying offensive gases, it only prevents their formation by destroying or inhibiting the germ action upon which they depend. Its destructive influence over the lower forms of animal and vegetable life has led to its employment as a disinfectant.

Koch finds that chlorine, bromine, and corrosive sublimate are decidedly more efficacious in destroying the bacilli spores of splenic fever than are carbolic acid, sulphurous acid and zinc chloride; and in general where heat cannot be employed, or the chlorine and bromine gases, he recommends the use of a mercuric salt, such as mercuric chloride, sulphate, or nitrate. (*See* Mercury and its salts.)

Carbolic acid is none the less an excellent disinfectant, and deservedly in much demand. For the disinfection of utensils, instruments, sheets, handkerchiefs, etc., a strength of 1 in 20 should be used. For the cleansing of the hands with free washing, 1 in 40 may suffice. For the disinfection of stools, four or five times the volume of the stool of a 1 in 20 solution should be used, but corrosive sublimate is better and cheaper. For the *disinfection of sputa*, on the other hand, carbolic acid is to be preferred, not less than four or five times the volume of a five per cent. solution of carbolic acid should be used.

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[1] The pigmentation of the urine is probably the result of the presence of *oxidation products* of the phenol group.

This applies in particular to tubercular sputa. (*Microparasites in Disease*. N.S.S., p. 518, Dr. R. Koch.)

In the case of the infective fevers, a sheet large enough to completely cover the doorway should be hung up at the entrance to the sick chamber. It should be kept moist with a solution of carbolic acid.

Creasote and carbolic acid act energetically on the skin, producing opaque, white patches, and exciting an active inflammation, which is followed, in a few days, by desquamation. They coagulate albumen, and are both stimulant and astringent; hence they may be employed to check bleeding, and to stimulate unhealthy, indolent sores.

Besides this superficial corrosive action, and the stimulant and astringent action, carbolic acid, locally applied, is an anæsthetic. Dr. A. H. Smith painted on his forearm a spot an inch in diameter, with an 85 per cent. solution of carbolic acid. For a minute it caused slight burning, then the skin became quite numb, whitened and shrivelled; at this point he made an incision half an inch long without even feeling the knife; the wound healed as usual. Three hours afterwards he thrust a needle into the skin without pain, and next he applied a blister to the carbolized skin without causing either pain or vesication. He found that in incising two whitlows this application greatly lessened the pain.

A piece of cotton wool just moistened with carbolic acid (the pure, liquefied acid), inserted into a carious tooth, is an excellent remedy for toothache: for the moment it may cause smart stinging.

Professor Erasmus Wilson employed carbolic acid as an anæsthetic, to diminish the pain arising from caustics, such as potassa fusa. Brushed over the delicate part or raw surface several times, the acid coagulates the albumen, "benumbs the surface, and permits the caustic action with a great reduction of pain." Mr. Wilson employed this method in lupus, epithelioma, and in disease of the glans penis and prepuce.

A solution of carbolic acid or of the glycerine of carbolic acid is often useful as a topical application to relieve itching, even the itching due to jaundice. Dr. Squibb says that the anæsthetic action is useful also in the treatment of burns and erysipelas, and that a one per cent. solution applied on lint and frequently renewed relieves the pain of burns within ten minutes, and that its influence, provided the application is used from the first, is persistent for twenty-four hours. For burns Whitla speaks in the highest praise of the use of carron oil to which two per cent. of carbolic acid has been added.

Provided inflammation runs not too high, the application of a carbolic acid ointment, composed of ten minims of the acid to an ounce of simple ointment, will moderate the weeping stage of eczema and allay the tingling and itching. It is useful also in the eczema of the heads of children.

A lotion consisting of one part of carbolic acid to one hundred parts of water is useful in pruritus ani. For this trouble Dr. J. Thompson employs marine lint soaked in carbolic lotion; he pushes every night a small plug into the anus, a part being left as a pad outside. Carbolic acid is useful also in pruritus pudendi. It may, however, cause considerable irritation both in pruritus ani et pudendi, the skin being sometimes so delicate that even a weak application causes considerable burning and smarting.

Carbolic acid has the great advantage over tar of being free from colour, but though useful in eczema, psoriasis, and prurigo, it is generally considered inferior to tar.

Dr. Aldersmith finds glycerine of carbolic acid very useful in the early stages of ringworm.

Dr. Eade recommends the use of carbolic acid for carbuncles and carbuncular boils. He employs a solution of one part of carbolic acid in four of glycerine or oil, and soaks in this small pieces of lint: these he thrusts through the openings in the broken skin down to the bottom of the holes and sinuses of the carbuncle; the surface of the carbuncle he keeps covered with lint soaked in the solution. This application, he maintains, prevents the extension of the carbuncle. This treatment is only useful in that late stage of the carbuncle when the skin is broken and the carbuncle discharging. Some surgeons advocate the injection of a small quantity of the pure, liquefied acid into the central slough, moving the point of the needle and injecting, say, half a drop at two, three or more points. This is with a view to obviate incision, and it is done at a comparatively early stage. Another modification of the carbolic acid treatment is to spray the carbuncle for 15–20 minutes every 4 hours, with a 2 per cent. solution of carbolic acid. This treatment gives splendid results according to Whitla.

Professor Hüter employs carbolic acid hypodermically in erysipelas. He uses the following formula:—Carbolic acid and alcohol, of each ʒss.; distilled water, ℥ij. Of this, six to eight syringefuls should be injected at different points where the inflammation is most intense, and should be repeated next day, or in a few days, if the disease spreads.

Carbolic acid applied topically is very useful in malignant pustule (anthrax). It may be injected in the neighbourhood of the pustule, and into the centre of the slough, the full strength of the acid being used; or compresses soaked in a five per cent. solution may be applied frequently. Some paint the diseased part with concentrated carbolic acid.

Glycerine of carbolic acid appears to me to be highly useful as a topical application to the throat in diphtheria. It should be applied twice a day, but to the diseased portions of the mucous membrane *only*.[1]

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[1] *The essential* in the local treatment of diphtheria is frequency of applica-

Carbolic acid spray to the nose, and a gargle of a 1 per cent. solution, are recommended in contagious coryza and sore-throat respectively.

A weak solution of carbolic acid is a very useful injection or wash for the cavities of large abscesses, also in empyema, after the evacuation of pus.[1] A like injection will correct the fœtor arising from cancer of the womb, or other uterine disease. Carbolic acid removes the stench and lessens the discharge in ozæna.

To gangrenous and ill-smelling sores, carbolic acid lotion is an excellent stimulant and antiseptic application.

Dr. Lloyd Roberts, of Manchester, was one of the earliest to draw attention to the virtues of carbolic acid, in ulcer of the os and cervix uteri, in chronic inflammation of the uterus and cervix with excoriation, and in chronic uterine catarrh. "I use," says Dr. Roberts, "invariably the pure acid. A capital plan for maintaining the fluidity of the acid, devised by Mr. Weir, of Dublin, and recommended by Dr. Roe, is to add a few grains of camphor to a little of the acid. In simple ulceration a free application of the acid drawn over the surface twice a week is sufficient. When it is necessary to apply the acid to the interior of the cervical canal I use a charged camel-hair pencil, or a gum-elastic catheter, having previously removed, with a piece of lint or injection of water, any impeding mucus. In applying it to the interior of the uterus by injection, it is very important to have the cervical canal freely open, so that any superfluous injection may pass freely out. Care should also be taken to ascertain the direction of the uterus, as in cases of retroflexion any of the injection passing beyond the curved portion of the organ and retained there would be certain to produce untoward consequences. When injected into the uterine cavity the acid should be diluted with glycerine and water, commencing with a weak solution, gradually increasing the strength as circumstances require. I also use this acid freely as an ordinary injection in vaginal leucorrhœa, uterine ulceration, and cancer; and it will be found an excellent cleanser, healer, disinfector, and allayer of pain. Although its action does not penetrate below the diseased surface, it possesses, in equal degree with the stronger caustics, the property of changing the vitality of the tissues, and produces rapid cicatrization, dissipates the inflammation and hypertrophy, and relieves pain."

An injection composed of twenty grains of sulpho-carbolate of zinc to eight ounces of water, used twice or thrice daily, is useful in gonorrhœa.

The investigations of Dr. Sansom, who first employed sulpho-carbo-

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tion, and accordingly it would be better to use a less strong solution of carbolic acid, *e.g.* the glycerine of carbolic acid diluted five or six times, and apply it more frequently, viz., every hour or two hours.

[1] In general free drainage is the one thing necessary in empyema, and injections are inadvisable, but occasionally it may be necessary to inject.

lates in medicine, prove that these salts arrest fermentation in different degrees, sulpho-carbolate of soda being most efficient, then the salts of magnesium, of potassium, and of ammonium in order. Administered to animals, they prevent the putrefaction and decomposition of the urine, although Sansom could not detect any of the salt in this excretion. He gave sulpho-carbolate, and then collected and preserved the urine, which after six months had not undergone decomposition. It is very probable that carbolic acid undergoes some transformation into a sulpho-carbolate, or an allied body in the act of absorption or subsequently.

Sulpho-carbolate of soda and carbolic acid are very useful in flatulence, especially when there is great distension, unaccompanied by pain, heartburn, or other dyspeptic symptoms. Sulpho-carbolate of soda will generally relieve extreme flatulence, which is productive of copious eructations and feelings of distension, symptoms not uncommon in middle-aged women and in phthisical patients. When flatulence occurs immediately after a meal, ten or fifteen grains of sulpho-carbolate of soda should be taken just before food; when it occurs some time after meals, the medicine in the same dose should be taken half an hour after food.

We often meet with patients, generally women, who suffer from what is ordinarily called "spasms." The patient complains of considerable flatulence and distension, often limited to one part, or sometimes more marked in one part, of the abdomen, generally on the left side under the ribs, and accompanied by severe pain, which, like the flatulence itself, is often most marked under the left side of the chest. The pain, relieved temporarily by the eructation of a little wind, soon returns and may endure many hours, or may recur at frequent intervals. In some cases the complaint is evidently a neuralgia of some of the abdominal nerves, the pain being chiefly excited by flatulence. Sulpho-carbolates, in doses of fifteen grains, or carbolic acid in one or two minim dose immediately before or after food, will prevent the formation of wind, and often afford considerable relief.

Carbolic is useful as a sedative to the stomach, as well as to check fermentation, and in one or two minim dose it is beneficial in many forms of vomiting due to irritation of the stomach.

Carbolic acid is readily absorbed by the skin. Taken internally or applied externally, even in small quantities, it will sometimes produce serious symptoms, some patients being affected much more readily than others; thus it may excite severe vomiting, giddiness, delirium, contracted pupils, irregular breathing, hæmoglobinuria, even coma or collapse, with weak pulse and cold sweat, also lowered temperature, even to the extent of several degrees. These toxic symptoms are, it is said, best combated by the free use of diluents, and, doubtless, the *symptoms* arising from tar would be benefited by the same means.

Injected under the skin of a frog, carbolic acid causes weakness, passing into complete paralysis, convulsions and death. During the toxic stage slight irritation of the skin induces violent convulsions. These convulsions are of central origin. Some believe they depend on the action of the poison upon the spinal cord; others conclude, on experimental grounds, that the convulsions are due to the effect of the poison on the central basal ganglia. The convulsions are tetanic in frogs, but clonic in warm-blooded animals. In the case of the centres in the spinal cord, as also of the respiratory and vaso-motor centres, there is first stimulation and then paralysis. Carbolic acid stimulates the sweat and salivary centres.

Professor Czerny describes a chronic carbolic poisoning which attacks surgeons much exposed to the spray. There is a slight headache, bronchial irritation, languor, diminished appetite. The legs feel heavy, there is nausea, especially in the morning. The patient complains of insomnia, and is anæmic, and his skin itches. These symptoms disappear with a few days' absence from the exciting cause.

Carbolic acid is recommended to reduce temperature in fevers, but it is inferior to many other anti-pyretics. Like other anti-pyretics it has a greater effect on the febrile than on the non-febrile temperature.

Carbolic acid, as spray or administered internally, is useful in coughs, especially when the secretion is abundant. A four per cent. spray, in addition to the administration of half a minim to two minims every three or four hours, is highly efficacious in whooping-cough. In this case we shall have a combined local and general treatment.

It will have been noted that the chief uses and actions of carbolic acid and its derivatives, the sulpho-carbolates, are topical.

It is said that sponging the exposed part of the body with a weak solution of carbolic acid will drive away mosquitoes.

ALCOHOL

For several reasons alcohol may be grouped conveniently with chloroform and ether, there being much similarity both in the action and structure of these three medicines. Each produces, at first, much excitement, with increased activity of the circulation, this stage after a time giving way to one of unconsciousness, which may be profound. With this general similarity, however, there is an important difference between alcohol on the one hand and chloroform and ether on the other, for, in the case of chloroform and ether the stage of excitement is brief, and soon passes into that of insensibility, which may endure a long time without danger to life; but in the case of alcohol the early stage of excitement and intoxication is of considerable duration, insensibility and unconsciousness not coming on till large quantities have been taken, and some time has elapsed. In this stage of alcoholic insensibility the danger of death is imminent from paralysis of the heart and of the movements of respiration. It will be easily understood, therefore, that while chloroform and ether are used as anæsthetics alcohol is inadmissible for this purpose. In spite of this difference the three drugs belong both chemically and pharmacologically to the same group.

Owing to its volatility, alcohol is sometimes employed to abstract heat, and cool the surface of the body, as in inflammation of the brain, etc., but it is not a very effectual refrigerator, and ice is preferable; as an evaporating lotion it is always used diluted with water.

If its evaporation is prevented, it penetrates the skin, owing to its tolerably high diffusion-power, and excites the tissues beneath the cuticle, causing a sensation of heat and some inflammation. It may be thus employed as a counter-irritant.

It coagulates albumen, and is sometimes used to cover sores with a thin, protective, air-excluding layer, which promotes the healing process beneath. Alcohol, in the form of brandy or of eau de Cologne, is often applied to harden the skin of parts exposed to pressure, and to obviate the occurrence of bed-sores: an excellent practice, which should be adopted before the occurrence of abrasion, or even before there is redness.

In nursing it is a useful practice to bathe the nipple with brandy, each time after suckling, then carefully to wash the part, and dab it dry. It is well to apply the brandy for some days before delivery, so as to harden the tissues, and prevent the formation of cracked nipples, an affection which gives rise to so much pain and distress.

In virtue, probably, of its power to coagulate albumen, and perhaps of other properties, it constringes, to a small extent, the mucous membranes of the mouth, and is therefore sometimes used, diluted with water, as an astringent gargle in relaxed throat, scurvy, salivation, etc.

In the stomach it exerts a double action. Thus it may affect both the gastric juice and the secreting mucous membrane. Its action in these respects will be considered separately. The effect of a small quantity of alcohol on the pepsine of the gastric juice is insignificant, but a large quantity precipitates the pepsine; the further addition of water redissolves it again. As for the gastric juice so for the mucous membrane, the topical effect of alcohol differs according to whether the dose is large or small. It has been experimentally proved that, taken very moderately, it increases the secretion of the gastric juice, and everyday experience confirms this fact; undue quantities on the other hand destroy the appetite, upset the stomach, inflame its mucous coat, cover it with a thick tenacious mucus, and abolish its secreting power.[1]

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[1] This much-debated question of the influence of alcohol on digestion is

Kept within moderate limits the influence of alcohol on the functions of the stomach is that of a remedial agent, as the following statements may bear out:—

I. Some persons, after undergoing considerable fatigue, are apt to lose all appetite and digestive power, and on taking food they suffer from the symptoms of an undigested load on the stomach; in such cases a glass of wine or a little brandy-and-water, taken shortly before food, will often restore appetite and promote digestion.

II. In the case of many dwellers in towns, who lead a sedentary life, and suffer from weak digestion, it is found that only by the help of alcohol in some form can they properly digest their food.

III. In the convalescence from acute disease, at which time digestion and strength may remain long depressed, alcoholic stimulants, taken just before or at meal-times, are often serviceable.

IV. In the prostration occurring during the actual progress of acute illness, digestion, in common with the other functions, is much depressed, and this at a time when it is most important to support the strength until the disease has done its worst. At this crisis it is absolutely essential that the body should be supported by food, yet the weakened stomach can digest but sparingly; this is the opportunity for alcohol which now spurs the flagging digestion to activity, and enables the patient to take and assimilate more food.

We must next consider the time for giving the alcoholic stimulant; this is a matter of great importance. It should not be given at haphazard, as is too often the case, but should be given at meal-times or along with the food. To a patient labouring under great prostration, in whom digestion is very feeble, food and stimulants will have to be administered in small quantities, frequently repeated; but to a strong patient the giving of food and stimulants should be at the ordinary meal-times, when, from habit, the stomach digests best.

It is necessary to insist on this point, the giving of food, viz., along with the stimulant, since both doctors and patients are too apt to trust to alcohol alone, forgetting that as, by stimulating the heart, alcohol at the same time effectually aids the digestive process, it will only be by combining food and stimulant that we shall get the full

even yet not definitely settled. According to some observers, small doses o alcohol, not too concentrated, promote the flow of gastric juice, whilst large doses in concentration excite a secretion which is neutral or faintly alkaline, and albuminous—in fact, a pathological secretion. Upon the digestive process itself it is admitted, truly, that alcohol present in more than 10 per cent. strength impedes peptic digestion, but small quantities in weak concentration are held to be indifferent to the same, by some observers, at least. Again, there are those who hold that whilst alcohol disturbs digestion at the outset, it leads, in proportion as it is absorbed, ultimately to an increased secretion of gastric juice. (Hammarsten, *Physiologische Chemie*, 1895.)

Even in large quantities alcohol appears neither to promote nor to hinder the conversion of starch into sugar.

value of the latter and be enabled to support the patient in the best and most natural manner.

It has been mentioned that large quantities of alcohol excite a catarrh of the stomach, but it is singular how large a quantity a patient prostrated by fever can take without producing this result. The same fact may be noticed in convalescence from exhausting diseases. Still, care must be exercised, for stimulants, too freely given, will often upset the stomach, and even cause the food to be vomited: an untoward circumstance greatly adding to the patient's danger. Indeed, the only safe way of prescribing alcohol is to treat it like a medicine and order it in *measured* quantity.

The prolonged indulgence in alcoholic drinks seriously damages the stomach, producing a chronic catarrh. The unhealthy mucous membrane, in this condition, coated with a tenacious mucus, excites an unhealthy fermentation of the food; at the same time, the structure of the mucous membrane itself undergoing considerable alteration, through great increase of the connective tissue, which by contraction obstructs and destroys the secreting follicles, with their lining cells, the secretions proper of the stomach are much impoverished. The mucous membrane ultimately becomes thickened, hardened, and uneven, and cysts form in its substance, caused by obliteration of the orifices of the follicles; these enlarge from the accumulation of cells within them. In consequence of these serious changes little gastric juice is poured out in response to the demand made by the food, while at the same time the unhealthy mucus coating the stomach, by exciting morbid fermentations, induces the production of much gas, with various acids, butyric, acetic, etc., whence, acidity and heartburn. Morning vomiting of a scanty, sour, bitter, and tenacious fluid is a characteristic symptom of this condition.

Owing to its high diffusion-power, alcohol passes readily into the blood, so that but little can reach far down into the intestines, yet spirits, especially brandy, are often successfully employed after the removal of the exciting irritant, to control the after-stages of acute simple diarrhœa, marked by frequent watery stools. Possibly this action of spirits is of the nature of a reflex, since we know how sympathetic is one part of the alimentary tract to an impression made upon another part.

In the vomiting and diarrhœa of children small doses of brandy, added to food, are very useful. Brandy often induces refreshing sleep in children.

Observations on the influence of alcohol on the blood and organs have yielded contradictory results, the most recent and elaborate investigations of Drs. Parkes and Wollowicz clashing in most particulars with those of previous experimenters. Hitherto it has been held that alcohol diminishes the oxidation of the body, but Parkes and Wollowicz's observations are opposed to this conclusion. Dr. G.

Harley found that alcohol in small quantities added to blood withdrawn from the body, lessened its absorption of oxygen and its elimination of carbonic acid.

As the result of a great many observations taken by me in conjunction with Dr. Rickards, every quarter of an hour, for periods of several hours, on persons of all ages, it was found that alcohol, brandy, and wine, diminish the body temperature. After moderate doses the fall was slight, amounting to not more than 0·4° to 0·6° Fah., but after poisonous doses the depression in one instance reached nearly three degrees: in rabbits the fall was much greater, reaching to ten or more degrees. These observations have been confirmed by Professor Binz, of Bonn, and by Dr. Richardson, who asserts that all alcohols reduce the animal temperature. Drs. Parkes and Wollowicz, whose observations are opposed to the foregoing, gave to a healthy young man, in divided quantities, for six days, a daily amount of absolute alcohol, varying from one to eight ounces, and, on a subsequent occasion, they gave twelve ounces of brandy, daily, for three days, observing meanwhile the temperature of the body every two hours. The average temperature of the alcohol- and of the brandy-drinking days was found to be almost identical with that on days when only water was taken. These conflicting results it is difficult to reconcile, but it must be granted that they prove that a considerable quantity of alcohol, repeated several times a day, need not permanently reduce the body temperature. Dr. Parkes has recently re-investigated this question, and he finds that dietetic doses (two fluid ounces of absolute alcohol) given to a healthy man *fasting*, and at rest, will often reduce the rectal temperature rather less than half a degree, but that when the alcohol is given with food, even in doses of four to eight ounces of absolute alcohol, it produces no effect on the temperature. In a boy aged ten, who had never in his life before taken alcohol in any form, I found through a large number of observations a constant and decided reduction of temperature. It is possible that alcohol given in repeated doses may soon lose its power of depressing the temperature. Excessive habitual indulgence appears to have this effect, for Dr. Rickards and I gave to an habitual drunkard, making him "dead drunk," twelve ounces of good brandy in a single dose, without the smallest reduction of the temperature.

The effect on the body temperature was formerly ascribed partly to the increased loss of heat through the skin by dilatation of the blood-vessels, and in a lesser degree to diminished heat production from a lessened oxidation; but Dr. B. Lewis and Drs. Wood and Reichert find that alcohol increases both heat production and heat dissipation, but whether the increased loss causes the increased production, or *vice versâ*, they are unable to decide. The time of greatest heat production coincides with the lowest bodily temperature; which suggests that increased *loss* leads to increased formation of heat.

This increased production of heat proves that alcohol does not influence temperature by lessening oxidation.

In their experiments on the urine Bocker and Hammond found that "the formation of urea, of the extractives, and of sulphuric acid and phosphoric acid, was lessened by alcohol and beer, and the water and free acidity of the urine was diminished;" but in Parkes' and Wollowicz's observations, alcohol, brandy, and claret produced no decreased elimination of the urea, phosphoric acid, or free acid of the urine. These alcoholic drinks, however, increased the amount of urinary water.

Edward Smith found that brandy and gin diminished, while rum increased, the pulmonary carbonic acid. These conflicting statements it is impossible to reconcile, but Parkes' observations were so carefully conducted, and are so complete, that they must be accepted as authoritative.[1]

How much alcohol is consumed in the body? The results of investigations to determine this point are so contradictory that it is impossible to decide the value of alcohol as a food. Bouchardat, Sandras, and Duchek conclude that alcohol is freely consumed in the body, little escaping by the urine, unless very large quantities are taken. On the other hand, Perrin, Duroy, and Lallemand deny that alcohol is consumed in the smallest degree in the body. Anstie concludes from careful experiments that the greater part of the alcohol is consumed, and he has undoubtedly proved that but little escapes in the urine; Parkes and Wollowicz believe that a considerable quantity escapes in the sweat and breath. Dupré's recent observations confirm those of Anstie, proving that only a fractional part of the alcohol escapes from the body; Anstie, indeed, believes that this elimination of unburnt alcohol never occurs except for narcotic doses, which vary in different persons. Hammarsten and Bunge assume as proved the consumption of the greater part of the alcohol, which amounts to 97 per cent. according to Bodländer.

However, even if the greater part of the alcohol is consumed, and thus ministers to the body as a force supplier, yet if it should depress functional activity, and favour degeneration, etc., it may do more harm than can be counterbalanced by any good which the force it sets free during its destruction can effect; in any case, even if taken in quantities too small to do harm, it can scarcely be classed as an economical food for the healthy. Granted, moreover, that dietetic doses check oxidation in the healthy body, and thus economize the blood and tissues, still, unless it can be shown that in health there is constantly an excess of consumption over and above that required, such a diminution of oxidation could only result in lessening the amount of force which is put at the disposal of the organs, and this, of course, would mean a diminution of the functional activity of the body. Physiology failing to guide our steps amid these conflicting statements, it is obvious that in estimating the value of alcohol in health or disease we must rely solely on experience, which shows plainly that, for the healthy, alcohol is not a necessary nor even a useful article of diet. Varied, repeated, and prolonged experience, and the testimony in particular of army medical men, prove that troops endure fatigue and the extremes of climate better if alcohol is altogether abstained from. The experience of the celebrated Moscow campaign showed this, and so also, a few years ago, the Red River expedition. During arduous marches it has always been found that, without alcohol, the health of the men is exceptionally good, but that as soon as spirits are allowed disease breaks out. Modern trainers recognise the fact that the power of sustained exertion and resistance to fatigue is best promoted by abstaining from alcohol, and the ill-health of many athletes depends, not on the rigour of the training, but on the excesses they indulge in after the contest.

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[1] More recent investigations seem to confirm Parkes' and Wollowicz's observations, for they tend to show that alcohol does not lessen the output of nitrogenous disintegration, in other words, that it does not protect the proteids of the tissues. As to the elimination of carbonic acid in the breath, recent observations indicate that there is little, if any, alteration in this output as a result of alcohol consumption, at least for moderate doses. If this is so, and alcohol is burnt up in the body, then, as Hammarsten says, it must mean that the burning of some food or tissue stuff is replaced by the *alcohol* burning, and that to this extent alcohol is itself a food. (*See Hammarsten, op. cit.*)

There can be no doubt that healthy persons, who are capable of the fullest amount of mental and physical exertion without the stimulus of alcohol, not only do not require it, but are far better without it.

It must be recollected, however, that these remarks apply to pure alcoholic drinks, such as spirits, and not to beers and wines, which contain ingredients useful as food. The amount of alcohol in the lighter beers and wines is small, and can hardly be prejudicial to the robust, while to the weakly, to many town-dwellers, and especially to those who pass much of their time indoors, in an unhealthy atmosphere, the same wines and beers appear to act as tonics. Some, indeed, cannot properly digest their food without a stimulant.

Dr. Anstie has extolled highly the use of alcoholic stimulants in the debility of old age, especially in the "condition of sleeplessness, attended often with slow and ineffectual digestion and a tendency to stomach cramps." He employed "a generous and potent wine," containing much ether.

Alcoholic drinks, especially those containing a large quantity of volatile ether, will often relieve the pain of neuralgia, the alcohol removing the temporary nervous depression which produces the paroxysm; alcohol for a time will relieve the distressing symptoms occurring in the so-called hysteria, generally met with in middle-aged women; but, inasmuch as the stimulant, after a time, must be taken in increasing quantities, there is great danger lest the patient should acquire the habit of taking alcohol to excess. Nervous or neuralgic patients are prone to imbibe alcohol in excess, and many women thus affected become confirmed tipplers. It behoves the doctor, then, to be very guarded and precise in prescribing alcoholic stimulants.

Whatever doubt may exist concerning the usefulness of alcohol in moderate quantities, there can be no question of its pernicious and poisonous effects when taken in excess. It then is distinctly toxic, causing injury to and degeneration of the tissues of all parts of the body and leading up to premature old age, marked by increase of the connective tissue (fibrosis) and fatty degeneration of the parenchymatous tissues (steatosis). The lungs then become prone to emphysema, the kidneys, liver, and stomach may become cirrhosed, and there is a general diminution of both physical and mental vigour. Even in a state of so-called health, when the evil effects of hard-drinking are not very apparent, they become at once evident on the occurrence of illness or accident, for then the constitution manifests its undermined condition and its diminished power to resist disease. Thus drunkards succumb to accident or illness which temperate men pass through easily.

Delirium tremens, the special form of nervous breakdown in alcohol poisoning, may arise in different ways: sometimes through a single debauch, but more commonly it attacks those who habitually take an excessive quantity of wine or spirits, without perhaps ever getting drunk. In an attack arising from an exceptional debauch it is merely necessary to withhold spirituous drinks for a time, so as to allow the system to get rid of the alcohol. On the other hand, delirium tremens in habitual topers is often excited by suddenly withholding intoxicating drinks, and hence in treating such chronic drinkers a moderate quantity of some alcoholic drink is for a time generally allowed. It is right, however, to add that many excellent observers contend that in all cases it is wiser to cut off the alcohol at once and completely, maintaining that the symptoms of delirium tremens are due to the paralysing action of alcohol on the nerve centres.

The influence of alcohol on the heart is most noteworthy. It strengthens the contractions of the heart, especially when this organ is weakened by debilitating diseases, these being always attended by a quickened and weakened pulse. In health, it is true, alcohol dilates the arterioles and makes the pulse larger and softer, but in disease, or when from other causes the arterioles are relaxed, it contracts them, rendering the pulse smaller, slower, less frequent, and more resistant; alcohol thus strengthens the pulse, and must be considered as one of the most powerful cardiac tonics which we possess. This *stimulant* property, combined with the influence of alcohol in *promoting digestion* by increasing the secretion of gastric juice, explains the great usefulness of alcoholic beverages in debilitating acute and chronic diseases.

In most diseases accompanied by weakness or prostration alcohol in one or other form often proves a valuable remedy. It is of conspicuous service in acute diseases running a limited and definite course, in the treatment of which the cardinal point is to sustain the vital force up to and beyond the critical stage.

Brandy and wine are the best remedies when the heart is suddenly enfeebled, as from fright, loss of blood, accidents, or other causes, and when syncope happens or threatens.[1]

Great as are the beneficial effects of alcohol in disease, yet it may do harm as well as good. Certain precautions must therefore be observed, and its effects on the functions must be carefully watched. Although the heart affords the most trustworthy information on this point, yet the influence of alcohol on the other organs must not be overlooked, as it may happen that while alcohol benefits one part of the system it injures another, doing some good in one respect, yet on the whole inflicting more harm.

The following rules regarding the use of stimulants in fever were laid down by Dr. Armstrong and endorsed by Dr. Graves; they will receive the assent of all practical men:—

1. If the tongue become more dry and baked, alcoholic stimulants are generally doing harm; if it become more moist, they are doing good.

2. If the pulse become quicker, they are doing harm; if it become slower, they are doing good.

3. If the skin become hot and parched, they are doing harm; if it become comfortably moist, they are doing good.

4. If the breathing become more hurried, they are doing harm; if it become more and more tranquil, they are doing good.

These excellent rules might be supplemented by a fifth:—alcohol does good when it produces sleep, and quells delirium. (*See* Opium.) Professor H. C. Wood adds yet another rule, viz., that whenever the smell of liquor appears in the breath the patient is almost certainly taking too much.

In judging of the influence of alcohol on the pulse, its compressibility is of more importance than its volume. Under the action of alcohol a soft and yielding pulse of large volume often becomes much smaller and less compressible, changes indicating an increase in the tonicity of the arteries, and in the force of the heart.

Such are the rules which must guide us in the employment of alcohol in disease; they give us the data both as to the quantity we should administer, and as to whether we should continue, increase, or withhold the drug.

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[1] In threatened fainting it is a good plan to direct the patient, whilst sitting down, to lean forward and place the head between the legs as low down as possible, so that the blood may gravitate to the brain.

There are other circumstances which we must carefully regard in respect to the employment of alcoholic drinks. At the two extremes of age, the powers of the body being easily depressed, stimulants are called for early, and must be used freely. In the aged, especially, it is of great importance to anticipate prostration by the early employment of alcohol, for in them it is very difficult to overcome this condition. Young children, prostrate from disease, take stimulants with benefit, even in large quantities. Next, the knowledge of the course which a disease runs ordinarily gives us timely indications in respect of alcohol administration. In some acute diseases, such as typhus, in which depression is often very marked (especially at the extremes of life), stimulants should be employed early.[1]

Alcohol is sometimes given to fever patients in very large quantities. It is given to reduce fever, and to check waste. In fevers, no doubt, there is greatly increased destruction, certainly of the nitrogenous tissues, as shown by the large quantity of urea eliminated in the urine; at the same time, all the functions of the body are much depressed, and the organs severally cannot appropriate so much of the force set free by oxidation as in health. From these two causes, and partly likewise because of the diminution of perspiration, whereby the heat fails to pass off in sufficient quantity by the skin,[2] a preternatural temperature of the body obtains in fevers. Under these circumstances, alcohol in large doses, it is maintained, lessens oxidation and prevents waste, and thereby lowers the temperature of the body, but to effect this very large doses may have to be given—doses which, in some cases at least, I should imagine, might do harm in other ways; hence the influence on the pulse, respiration, etc., according to the rules just laid down, must be very carefully watched.

Several years ago I made a large number of observations concerning the influence of alcohol on the temperature of fever, and found that as in health, so in fevers, alcohol slightly reduces the temperature, but that its efficacy in this respect is so insignificant, and doses so enormous must be taken to produce even trifling results, that it is useless to give alcohol solely with this intention.

In my judgment, there can be no doubt that alcohol is not required in all febrile diseases, and that, on the contrary, many cases are best treated without it. Thus children and young persons previously healthy rarely require it, and in no instance should it be given unless special indications arise. The enormous quantities of alcohol which used to be given a short time ago, and are indeed now sometimes administered, are, I believe, rarely needed, although on occasion very large doses may be needed, and may then undoubtedly be the means of saving life. Speaking generally, one may perhaps say that in *fevers* one is not likely to get much value out of doses in excess of six or eight ounces of spirit per diem.

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[1] Sir William Jenner used to say that if in doubt as to the advisability of giving alcohol in typhus he gave it, but if in doubt in a case of typhoid he withheld it; thereby indicating the greater danger from prostration in the former disease.

[2] The wet skin of rheumatic fever shows that a deficient surface moisture is not an invariable accompaniment of pyrexia.

The kind of alcoholic stimulant employed is perhaps not a matter of great importance, provided that its quality is good. It is undesirable to give several kinds of stimulants at the same time, as they may derange the stomach, but they may be changed from time to time according to the patient's desire. Anstie recommends strong alcoholic drinks in fevers, *e.g.* brandy, in the earlier and middle stages, but when the heart flags, and the nervous system has become weakened, he prefers wines containing plenty of compound ethers. To weakly persons stimulants should not be given in large quantities at distant intervals of the day; in such case it is far better to give the wine or spirit in small and frequent doses. The reason for this is that though a large dose strongly stimulates the heart for the time being, yet, as the alcohol is gradually decomposed or eliminated, the heart support is withdrawn and great weakness may set in; the frequent administration of smaller quantities keeps the heart more uniformly sustained.

Some easily digested food in small quantities should be given along with the stimulant. As a rule, when food is freely taken and digested, stimulants are little needed.

Weakly children often derive more benefit by taking stimulants about an hour before, rather than actually with the food; this plan enables them to take more food, and to digest it better, than when the more usual plan is adopted of giving the stimulant with the food.

In the prostration which attends some forms of poisoning, *e.g.* in snake-bite, alcohol may be called for in fullest dose. Rules as to administration with food, as to guiding symptoms, etc., do not hold here; the danger threatens immediately, and must be met at once and with energy. Wood speaks of the beneficial administration of a pint of whisky in one hour in a case of snake-bite.

In common with ether and chloroform, alcohol is an antispasmodic, but in this respect ether and chloroform are more effective.

It does sometimes happen that one alcoholic stimulant is harmful, while another is found useful; a fact especially noticeable in the case of coughs, which may be aggravated by porter or beer, but unaffected or even relieved by brandy or wine. Beer or stout sometimes produces sleepiness, heaviness, even headache, and flushing of the face, while the same person who suffers thus may be able to take wine or brandy without inconvenience. Individual peculiarities abound in respect of wines; for example, one person cannot take sherry without sufferin from acidity, while another, on taking port, is seized with gouty pains.[1]

The wish of the patient for any particular form of stimulant is often a correct indication of its desirability. A free draught of the weaker beers will often slake gratefully the urgent thirst of fever.

Stout is supporting and nourishing to persons brought low by exhausting discharges, and to women weakened by suckling, though in many cases it disagrees, unfortunately, producing headache and sleepiness. The good old-fashioned remedy, rum or brandy and milk taken before breakfast, is useful in phthisis and in exhausting diseases. A little rum and milk an hour before rising is a good prop to town-living women, to whom dressing is a great fatigue, and who, without appetite for breakfast, suffer from morning languor and exhaustion, often lasting till mid-day; it is useful also to convalescents from acute disease.

The ill-effects of alcohol in gonorrhœa are well known. A cure is much more readily effected if the patient will abstain altogether from alcoholic beverages. Even when the cure seems near completion, a single indulgence in spirits, wine, or beer, will bring back the scalding and the discharge.

In some persons, alcohol, unless in a very dilute form, and in very moderate dose, quickly affects piles. Beer, champagne, port, strong claret, may even within a few minutes cause burning pain and aching in the rectum, lasting for hours. With some persons coffee or pepper acts in the same rapid way.

CHLOROFORM

CHLOROFORM, when applied to the surface of the body, speedily volatilizes and cools the skin, but it is seldom used as a refrigerator, being in this respect inferior to other agents.

Owing to its high diffusion-power chloroform readily penetrates the animal textures. Hence, if evaporation is prevented, it quickly penetrates the cuticle; in so doing it excites the part, and thus becomes a rubefacient, or it may cause actual inflammation.

In quantity insufficient to excite inflammation chloroform deadens sensation, and acts as a local anæsthetic. It is sometimes applied for this purpose, and occasionally with good effect, although it often fails; it is however inferior as a local anæsthetic to many other external applications, but may be usefully combined with other similarly acting agents. Singly it has been used in neuralgias, sometimes effectively, but more generally it fails, and even when successful, the relief which it gives is as a rule very temporary, the pain soon returning.

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[1] Bearing upon this point are some experiments which I made with Dr. Sainsbury upon the influence of the higher terms of the ethylic alcohol series upon the frog-heart. We found that with each step upwards in the series there was a very great increase in toxic action—propylic being more poisonous than ethylic, butylic than propylic, amylic than butylic, and so forth. These experiments confirmed the general view that the so-called fusel oil which, more or less, may contaminate the several spirits of commerce, and which consists of a mixture of these higher alcohols, is a very harmful *contaminant*, and one serious danger in the use of the cruder wines and *spirits*.

In faceache or toothache two or three drops on a small piece of cotton-wool, introduced into the ear, will occasionally give complete and permanent relief; but if too large a quantity is used it will excite inflammation, or even vesication, and give much annoyance. The pain of cancer, when the skin is broken, and there is a painful, irritable, open sore, is relieved by playing the vapour of chloroform on the raw surface; the immunity from pain thus obtained will often last several hours. A like proceeding will relieve the pain of cancer of the uterus, of ulceration of the os uteri, of neuralgia of the uterus, and, in a lesser degree, the annoyance of pruritus pudendi. The vapour must be made to play on the os uteri for some minutes. I think that chloroform vapour might be useful in cancer of the rectum, spasms of the intestines, etc., bearing in mind, however, that it is easily absorbed by the large intestine.

According to Sir J. Simpson, a few drops of chloroform made to evaporate from the palm of the hand, held close to a photophobic eye, will enable it to bear the light without pain.

Dr. Churchill lessens the violence of the paroxysms of whooping-cough by the simple plan of directing the nurse to pour about half a drachm of ether or chloroform over her hand, and to hold it before the child's mouth. The child at first dislikes this treatment, but soon appreciating its benefit, will run to the nurse on the first warning of an attack. The main part of this action will probably be a local one, since the amount absorbed into the blood will be small.

An ointment, composed of half a drachm of chloroform to an ounce of lard, will often allay the itching of urticaria, lichen, and true prurigo, but, like most other similar applications, it loses its effect in a short time; in general, applications to relieve itching require to be changed from time to time.

Dr. Augustus Waller has shown that chloroform promotes to a considerable extent the cutaneous absorption of many substances. The absorption of watery or alcoholic solutions is far less rapid. The chloroformic solutions of aconite, atropia, strychnia, and opium, applied to the skin, speedily destroy an animal, with the characteristic toxic symptoms of the drug employed. He ascribes this action of chloroform to its property of passing rapidly through animal textures, carrying with it the dissolved alkaloid. The addition of a certain amount of alcohol to the chloroformic solution does not hinder the absorption of the alkaloid—indeed, it appears to hasten it, for when an equal quantity of alcohol is added to the chloroformic solution the absorption is more rapid than when simple chloroform is used. This property of chloroform, either alone or mixed with alcohol, should be borne in mind in employing alkaloids as external applications.

Chloroform produces in the mouth a sensation of warmth, and if undiluted excites inflammation. Being a stimulant to the mucous membrane, it excites a flow of saliva. A few drops on cotton-wool inserted into the hollow of a decayed aching tooth often gives permanent relief, but when the immediate anæsthetic effect has passed away the pain is sometimes aggravated, the chloroform having irritated the inflamed pulp. It is a good plan to fold over the hollow tooth a piece of linen moistened with chloroform, so that the vapour may have access to the pulp. Equal parts of chloroform and opium, or of chloroform and creasote, constitute a useful application in toothache.

Chloroform excites a sensation of warmth in the stomach, but in large doses it induces nausea and vomiting. One to three drop doses of pure chloroform are beneficial in flatulent distensions of the stomach, sea-sickness, and other vomitings.

Its high diffusion-power enables it to pass so rapidly into the blood, that little, if any, finds its way into the intestines. The physical and chemical changes produced in the blood by its admixture with chloroform are at present unknown.

When given in medicinal doses to a *healthy* person it produces very little change, either in the frequency or strength of the heart's contractions, though when inhaled, judging by the hæmodynamometer, it is said at the very first to slightly increase their force. In disease, on the other hand, when the heart beats feebly, especially if this be due to some sudden and transient cause, chloroform certainly strengthens the heart's contractions, thus relieving such symptoms as syncope, etc.; it is, however, in no way preferable to a dose of brandy-and-water or wine. It no doubt acts more quickly than alcohol, but its action, especially its cardiac effect, certainly declines more speedily than does that of alcohol. It is frequently administered to hysterical patients and others suffering from weakness, depression of spirits, nervousness, etc. Like all stimulants, if habitually ingested, it soon loses its effect; this holds particularly for chloroform and ether, so that from time to time the dose requires to be increased, and even then these drugs soon lose their efficacy.

In diarrhœa, after the removal of the local irritant, spirit of chloroform may be given with much benefit, combined with astringents and opium. It is useful in intestinal and summer colic, from whatever cause arising, and in renal and biliary colic, in hiccough, and in asthma, both primary and secondary; from the relief which it gives in these affections it is ranked among antispasmodics. In the treatment of any of the foregoing diseases it is usually combined with opium, and this combination succeeds admirably. No doubt much of the effect is due to the opium; its action, however, is increased and perhaps accelerated by the chloroform. Its mode of action is at present unknown. Possibly, by restoring the weakened muscular or nervous system to its natural physical condition, it controls inordinate muscular action and removes pain, thus becoming a true stimulant.

Chloroform, combined with small doses of morphia, or opium, and given with a drachm of glycerine, honey, sugar-and-water, syrup of lemons, syrup of Virginian prune, or treacle-and-water, is often conspicuously beneficial in certain coughs. It is useful when the cough is paroxysmal and violent—violent out of proportion to the amount of expectoration, when, indeed, there appears to be much excitability or irritability in the respiratory organs, and when a slight irritation induces a distressing fit of coughing. In such circumstances the chloroform is of more service than the opium, and should be given in full dose, while the dose of opium should be relatively very small. This combination allays the cough in the fibroid form of phthisis, so frequently paroxysmal, wearing, and exhausting. In this form of lung disease there is often such extensive induration, with thickening of the pleura, as to prevent any expansion of the lung, and consequently of the chest walls, so that little or no air enters the consolidated part of the lung, and no expulsive force can be brought to bear on the mucus. Here our attention should also be given to the checking any overabundance of secretion, to the lessening of its tenacity, and so to the facilitation of its expulsion.

Cough, very often indeed, arises from a morbid condition of throat, but even when due solely to lung disease, the application of the mixture just recommended, to the throat and parts about the glottis, is often beneficial, in accordance with the general law that remedies applied to the orifices of tubes constituting, or communicating with, certain organs, as in the case of the nipple, rectum, and throat, will by nervous communication act upon the organs themselves. For the same reason we find that many coughs are allayed much more efficiently if the opium and chloroform mixture is swallowed slowly, and so kept in contact with the fauces as long as possible.

Being highly volatile, much chloroform passes off by the lungs, and its odour can be detected in the breath; some, probably for the same reason, escapes by the skin, and some probably by the urine. In its passage from the lungs it is unlikely to influence appreciably the mucous membrane of the bronchial tubes, the quantity separated being very small, nor do we even during and after the inhalation of chloroform observe that it modifies in any way the secretion of this membrane. Its influence, if any, on the kidneys and the urine is at present unknown.

Harley's observations on the action of chloroform on the respiratory function of the blood tend to show that it lessens the oxidation of the blood, and diminishes the evolution of carbonic acid; but to establish this point further experiments are, we think, needed.

We will now give a succinct and practical account of the administration of chloroform as an anæsthetic. It is needless to dwell upon the signal and beneficent service which in this respect this agent has rendered to mankind.

At first chloroform is liable to cause a sensation of tingling and of heat in the lips and nose, and these parts, if accidentally moistened with it, may become inflamed, even to blistering: an accident which can always be prevented with care, particularly if the nose and lips are first smeared with glycerine or cold cream, or some protecting substance. This is of course a purely local effect.

The early sensations experienced vary much in different persons, being sometimes so agreeable as to tempt to the inhalation of this substance merely for the sake of inducing them, but in the majority of cases the sensations are more or less disagreeable, often intensely so.

To begin with there is a sensation of warmth at the pit of the stomach, spreading to the extremities, and accompanied by some excitement; then some or all of the following symptoms soon set in. Noises in the ears, lights before the eyes, heavy weight and oppression at the chest, great beating of the heart, throbbing of the large vessels, and a choking sensation. These symptoms betoken no danger, and need excite no apprehension. At the very commencement of the administration some cough is not unfrequently excited, or even a passing spasm of the glottis, sure signs that the vapour is administered in too concentrated a form, and that more air must be mixed with it; this is done by opening the valve of Clover's apparatus, or by removing the lint farther from the nose and mouth.

At this early stage, women may become hysterical, and give some trouble and alarm. They will laugh, sob, or cry, and the breathing is often extremely irregular and hurried—a condition which frightens the friends, and inexperienced chloroformists; this state, however, is to be accepted as an indication to continue, not to withhold, the chloroform, for this condition soon subsides as the patient passes more deeply under the power of the anæsthetic.

In this same stage the pulse may be quick and weak; but this, if not due to the patient's illness, is the effect of nervousness and anxiety, and as soon, therefore, as unconsciousness sets in, the pulse falls in frequency, and gains in force.

A few seconds from the commencement of the administration all *discomfort* ceases, the patient becomes quiet, breathes calmly, and feels brave. The consciousness is now more or less affected; questions are still heard, but they are answered slowly, and not to the purpose. The induction of this medium stage is adequate for confinement, and for the relief of renal colic.

The inhalation being continued, all knowledge of the external world soon becomes lost, and this is accompanied or followed by a period of excitement. Various incoherent ideas now occupy the mind, and under their influence some persons struggle, attempt to get up, and, when restrained, often show much irritation. The stage of complete unconsciousness required for major operations is now fast approaching. Violent tonic contraction of the muscles of the body often occurs just before the setting in of complete unconsciousness and perfect muscular relaxation. In the stage of tonic contraction the extremities become rigid, the muscles of the chest are firmly fixed, and the respiration becoming impeded, there is caused a duskiness or lividity of the face; the eyes are injected or prominent, the lips blue, the jugulars stand out like large black cords, the mouth is clenched, and a profuse perspiration breaks out on the body, especially about the face. In a few seconds all these symptoms pass away. They may be accepted as a sure indication of the immediate approach of utter insensibility, with complete flaccidity of the muscles, and as a warning that the administration must be conducted with increased caution, or the patient will pass suddenly into a state of danger, with noisy, stertorous, but quick and shallow breathing, and quick, weak pulse. They are more frequently seen when the chloroform is administered too abundantly, and the patient brought too quickly under its influence. These violent muscular contractions, which greatly distort the face, and frighten the patient's friends, rarely occur in women or children, or in men weakened by exhausting illness.

With the cessation of this stage of tonic contraction, the muscles become flaccid, and the stage of perfect insensibility is reached. Reflex action is now lost, for whilst in the preceding stages it was the brain which was chiefly affected, now the spinal cord becomes paralyzed. At this point the conjunctiva can be touched without producing winking, and the limbs, when raised and let go, fall heavily. The while the breathing is calm, but a little superficial; the pulse not much altered, though it may be a little more compressible. The face is moist with perspiration. The pupil is much contracted. This condition may be maintained with *due precaution* for a considerable time, but if the chloroform is continued in undiminished quantity the breathing becomes noisy and stertorous, the pupil dilates widely, the pulse loses its strength, the breathing becomes more and more shallow, and less and less frequent, till both pulse and respiration stop; the respiratory centre is the first to become paralyzed. Even now artificial respiration will often restore the breathing, bring back the pulse-beats at the wrist, and restore the patient from the jaws of death. On several occasions, while administering chloroform, I have witnessed recovery from this critical condition.

On the other hand, it appears that *sometimes*, without warning, while the pulse is beating well and the breathing is deep and quiet, the heart will suddenly stop, and respiration immediately cease. This form of death arises probably from cardiac syncope, while the other form of death is due to paralysis of respiration from the effect of the chloroform on the respiratory centres. (*See* Belladonna.)

Chloroform insensibility may with care be maintained for hours, and even days.

In administering chloroform, attention should be directed to the breathing, the state of the pulse, the conjunctiva, and the pupil.

The careful watching of the breathing and the removal of any impediments to the free working of the chest are absolutely essential to the safe administration of chloroform, and many indeed claim that the administrator is to be guided solely by the effect on respiration—withholding or diminishing the administration on the occurrence of any embarrassment in frequency or shallowness of the breathing, and proceeding *at once* to artificial respiration if the breathing stop.

The pulse usually retains throughout its frequency and force. Should it become quick and weak, or irregular, then the inhalation must be withheld, unless the frequency of the beats can be accounted for by the patient's struggles.

The state of the conjunctiva and pupil affords important indications as to safety, and some of the earliest signals of danger. So long as irritation of the conjunctiva causes reflex action, and is followed by blinking, there is usually no danger. The pupil is much contracted in the stages of insensibility when no danger is to be apprehended, but on the approach of peril from over-dose of the anæsthetic, the pupil dilates.

It is concluded that chloroform affects the pupil by first stimulating, and then paralyzing the motor oculi nerve centres, for during the contraction of the pupil stimulation of the cervical sympathetic is without effect, but when the pupil begins to dilate this stimulation increases the dilatation.[1]

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[1] Dr. Buxton has kindly given me the following:—"There is a caution necessary with regard to permitting operations to be commenced before the patient is completely under the influence of the anæsthetic. Without attempting to theorise as to the cause, it is undeniably a dangerous practice, and many deaths have occurred when it has been followed. It should in every case be made a rule that no operative measures of any kind be allowed until the patient is in the stage of relaxation. It is important to be able to obtain early warning that vomiting during chloroform narcosis is about to supervene. The pupil will, as was pointed out by M. Budin, afford a clue. He found, and my experience confirms his statement, that when the patient *is about* to vomit the pupils commence gradually to dilate. I have often observed that efforts at swallowing air are initiated at this time, and that

When, on touching the conjunctiva, reflex action is annulled, and the limbs, when raised, fall heavily, the patient is fit to undergo any operation.

One or two circumstances require a passing notice. Vomiting is liable to happen if food has been taken a short time before the chloroform administration; it occurs either as the patient is passing under its influence, or more commonly on the recovery from it, ceasing always when the patient is under the full effect of the chloroform. Vomiting, happening after complete chloroformization, may be taken as a sign of returning consciousness, and, if the operation is still unfinished, the inhalation should forthwith be continued, upon which the vomiting will speedily cease. In order, however, to avoid vomiting, it is advisable that the patient should take no food for three or four hours before chloroformization. At the same time too long a fast should be avoided, or its very purpose may be defeated by the induction of a tendency to vomit, whilst fainting and much exhaustion may occur from any small loss of blood during the operation. If in spite of every precaution vomiting take place, the head should be turned aside to assist the escape of the vomited food, and to prevent choking.

It should be borne in mind that operations on the rectum and vagina, even when the patient is quite insensible, will often, nay generally, cause noisy catchy breathing, very much resembling stertor, often indeed mistaken for it, and sometimes thought to indicate that too much chloroform has been administered; this, however, is not the case. The true state of things can generally be discriminated by a little attention to the circumstances. Thus, the noisy breathing does not occur until the rectum and vagina are manipulated, and it is especially loud and noisy when the finger or an instrument is passed with any force into either orifice.

On discontinuing the administration, consciousness usually returns in a few minutes, but sometimes this is delayed for a longer period. If perfect quiet is observed, sleep may follow, which refreshes the patient, gives time for many of the disagreeable consequences of the inhalation to pass off, and allows the pain of the operation to subside.

Experiment, practice, and common sense show that the danger of chloroform is in proportion to the percentage of vapour inhaled in the air. The importance therefore of ascertaining the minimum quantity

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the pulse flags slightly. If now the chloroformization is discontinued, the pupils dilate widely, vomiting occurs, and the patient regains consciousness rapidly. But, on the other hand, if the chloroformist, aware of the import of these signs, pushes the chloroform, the pupils regain the contraction which is normal to the state of relaxation, and vomiting is obviated, while the pulse recovers its force. The gradual dilatation spoken of above must not be confounded with the sudden mydriasis which betokens grave danger. In this last case, stertor, shallow breathing and marked lessening of the pulse force also occur, together with cyanosis."

sufficient to bring the patient speedily and safely to a state of insensibility is apparent. Mr. Clover has shown this to be in the strength of 4 to 5 per cent. of chloroform vapour. With this percentage insensibility can be produced in about five minutes, with the minimum of danger. In animals killed by the inhalation of this proportion of chloroform the heart will continue to beat long after respiration has stopped. At the beginning Mr. Clover administers about 2 per cent. of vapour, and as the patient becomes accustomed to its action the quantity is increased till 5 per cent. is reached.

When any serious symptoms arise, and danger is apprehended, the chloroform administration should, of course, be discontinued, and artificial respiration, after Sylvester's method, instantly and assiduously practised; this should be done whether the breathing has ceased or is growing slower and shallower. When the breathing has been extinguished in a gradual manner, the patient, provided that artificial respiration has been instantly adopted, will in a few seconds (in most instances) fetch a deep gasp, which is soon repeated, and presently the breathing will grow more frequent, till at last it becomes natural, and the patient is saved. Even when the chest has ceased to move, the pulse to beat, and the patient presents all the appearances of death, even at this crisis life may generally be restored. Little is to be hoped, however, from artificial respiration in those cases in which the breathing and pulse both cease immediately and without any warning. As additional restoratives, cold water should be dashed over the face and chest, air should be freely admitted, and all hindrance to breathing removed; indeed, everything hampering the breathing, such as stays or a tight dress, should be removed before the administration of chloroform. The most serious impediment to the breathing, quite sufficient to endanger life, may be caused by the patient lying prone for the convenience of the operator. Several times have I witnessed cases of imminent danger from this cause. When this position must be assumed, the most anxious care must be paid to the state of breathing, for this prone posture is itself quite adequate to arrest a feeble breathing, which without this impediment would go on safely. *A fortiori*, in those cases of disease of one side of the chest, *e.g.* empyæma, is it of vital importance that the sound side should have the freest play. The turning of the patient on to the sound side to facilitate operation on the diseased side is therefore most perilous.

It is a question of importance, whether galvanism should be used in danger from chloroform. The Committee appointed by the Medical and Chirurgical Society are of opinion that this agent is useful, though far inferior to artificial respiration, but some authorities are *wholly* opposed to its use, on the score of its inhibiting influence on a *feebly acting* heart. If used, it is advised to apply it to the phrenic nerve in order to stimulate the diaphragm to action, and thus maintain breathing till the chloroform shall have had time to evaporate from the blood, and the system have become free from the drug. But as stated artificial respiration is a more potent agent to excite the respiratory functions.

It has been proved that a certain percentage of chloroform, amply sufficient to speedily produce complete unconsciousness, can be inhaled with safety for an almost indefinite time. It is, therefore, obvious that the method to be selected should enable us to give this percentage with certainty throughout the most protracted operation. The contrivance which best fulfils this condition is the ingenious apparatus of Mr. Clover. Its advantages are so great as to out-balance fully the slight inconvenience connected with its use. If this apparatus is not at hand, we may adopt the use of a simple piece of lint and a towel, or Dr. Simpson's method, or Skinner's cone.

Are there any conditions of age or health which forbid the use of chloroform as an anæsthetic? Provided that due care is observed, I think it may be given to all persons irrespective of their condition, having myself given it, without any threatening symptoms, in serious heart disease, in every stage of phthisis, in Bright's disease, cancer, chronic bronchitis, to patients almost dead of exhaustion from loss of blood, to children of a few weeks, and to persons close upon a hundred years old. No doubt a dilated or a fatty heart adds to a patient's risk, and will enforce on the operator more care and anxiety, and in like manner the two extremes of age are conditions which will exact close watching whilst giving chloroform.

Inhalation of chloroform is better borne by the weak, by those depressed by illness, and by women and children, than it is by healthy, robust men.

As might be expected from the similarity between alcohol and chloroform, we find that to induce unconsciousness in persons who take alcohol to excess more chloroform is required than in the case of the temperate.

Chloroform inhalation is now frequently used with much advantage during delivery; it eases the uterine pains without increasing the danger to mother or child. It is not necessary to obtain complete unconsciousness, but to give just sufficient chloroform to dull the pains. If this recommendation is disregarded, and the anæsthetic is pushed to the stage of complete unconsciousness, it weakens the contraction of the womb and retards delivery. It is true that even if slight unconsciousness only is produced, the uterine contractions are probably somewhat weakened, but accoucheurs maintain that this disadvantage is more than compensated by the relaxation of the parts, and the abatement of spasms. Dr. Playfair, who thinks chloroform inhalation is used too indiscriminately, says he has often observed the pains alter, and become less effectual after chloroformization, and that when chloroform administration is prolonged he thinks it favours *post-partum* hæmorrhage. (*See* Chloral.)

In the reduction of hernia its use is obvious. It may also be used to assist the diagnosis of abdominal tumours, when deep-seated, and when the walls of the belly are hard and rigid. It is likewise useful in determining the nature of the so-called phantom tumours, which disappear entirely when the patient is made insensible by an anæsthetic.

In dental operations the patient incurs some additional risk of syncope from chloroform, owing to the sitting posture. Chloroform should be avoided in dentistry, and, indeed, it is now superseded by nitrous oxide.

Chloroform inhalation may be used with signal benefit in renal and biliary colic. In my experience it is inferior only to morphia injection, and is very far superior to opium, warm baths, and the ordinary treatment in vogue. It removes the severe pain before unconsciousness is reached; indeed, it is never necessary to carry the administration of chloroform very far. The pain, it is true, often returns speedily, but it may be quelled again, and after two, or at most three, administrations, may be permanently removed.

Chloroform inhalation in the treatment of chorea is sometimes very valuable. It is applicable especially to those serious cases in which violent and constant movements prevent sleep, and even the swallowing of food, so that speedy exhaustion and death are to be apprehended. In such cases chloroform often induces refreshing sleep, the sufferer passing from the insensibility of chloroform into that of natural sleep, and after perhaps some hours waking up soothed, refreshed, and with a marked abatement of the movements. So great is this improvement sometimes, that patients, who before the chloroform could scarcely be restrained in bed, will, after waking, sit up, troubled with only slight involuntary movement, and eat with ease. Soon, however, the movements return, upon which the inhalation must be repeated. At first this should be administered three times a day, then, according to the improvement, twice, and after a time once a day. This treatment, it is stated, will cure the disease, on an average, in twenty-eight days. (*See* Chloral.) In delirium tremens, when the usual means fail to induce sleep, it has been advised to produce unconsciousness by chloroform inhalation.

Chloroform inhalation will temporarily arrest convulsive fits, especially in children; sometimes the arrest is permanent. Chloroform inhalation is of great service in puerperal convulsions. It is necessary in some cases to maintain unconsciousness for hours, or even days, allowing the patient to wake every three or four hours to take food. It is sometimes very useful in uræmic convulsions.

Chloroform inhalation gives relief in various forms of pain or *distress*, thus in neuralgia, sciatica, colic of the intestines, if the pain is very severe; also in distressing dyspnœa, whether this is due to asthma, aneurism, etc. Mr. Gascoin reports a case of bronchitic asthma much benefited by rubbing the chest for an hour daily with liniment of chloroform. He attributes the success to the friction, and refers to a "Widow Pau," who has obtained a reputation in Paris by using friction in cases of asthma. In asthma the inhalation of a few whiffs will, without producing unconsciousness, sometimes afford relief, and should the paroxysm return, on the passing away of the chloroform effects, the inhalation may be repeated. A small quantity of chloroform, given in this way, often will suffice to avert an attack, though in most cases the effects are only transient, the paroxysm returning as the influence of the drug wears off. The administration of eight or ten drops on a lump of sugar is also a useful method of giving chloroform in a paroxysm of asthma, and, indeed, in other spasmodic diseases.

Dr. Bartholow finds that the injection of five to fifteen minims of chloroform into the neighbourhood of a neuralgic nerve is very useful, and that it sometimes has a permanently good effect. He finds that spirits of chloroform, ether, and alcohol, are likewise beneficial. It must not be forgotten, however, that the injection of chloroform is sometimes followed by troublesome ulceration.

Dr. Buckler recommends 5 to 60 drops of chloroform by the stomach in biliary colic; the dose to be repeated every four or six hours. The chloroform is said to dissolve the calculus, but inasmuch as it takes several hours' immersion in chloroform itself to dissolve even a small calculus, this statement must be received with caution; the treatment, however, is undoubtedly useful. In similar cases I have frequently administered five, ten, and twenty drops on a piece of sugar every quarter of an hour with great relief to the pain. This same treatment, or, in its place, half a drachm to a drachm of ether every half-hour, is very useful in persistent hiccough, the paroxysm of asthma, and other spasmodic diseases.

For tape-worm chloroform has been highly recommended in drachm doses, taken in the morning fasting, after a light supper the previous evening; few, however, will, I presume, treat tape-worm in this way, and the recommendation is chiefly interesting as indicating that such large doses as these may be taken without risk, at least by many persons. Dr. Davidson Scott says he has given a drachm dose in "more than 500 cases." He uses it as a hypnotic, this dose inducing about two hours' sleep. He has "frequently" given undiluted chloroform, in teaspoonful dose, to children two and three years of age; and in one instance, a case of puerperal convulsions, he gave undiluted a tablespoonful of chloroform, which dose arrested the convulsions and induced quiet sleep!

Insomnia, tremulousness, and inability to fix the attention, are, it is said, apt to follow the repeated use of chloroform inhalations.

In conclusion, to return for one moment to the question of the influence of chloroform upon the heart, we may say that the report of the Hyderabad Commission on this subject, which was to the effect that the respiration alone was endangered by inhalation, has not reversed the opinion of anæsthetists generally, in this country at least, that chloroform does endanger the heart also, and will sometimes kill by arrest of the heart before the breathing has stopped. The experiments, moreover, of MacWilliam and of Gaskell and Shore bear out this opinion, for they show a direct weakening of the heart by this drug.

In some experiments on the frog-heart by means of Roy's tonometer, in which I used the entire ventricle, and also the lower two-thirds of the ventricle, I found that chloroform, ethidene dichloride, and bromide of ethyl, will, by their direct action on its muscular substance, paralyze the ventricles.

I found further that chloroform and ethidene dichloride are about equally poisonous to the heart's substance. These experiments showed, also, that chloroform and ethidene dichloride were far more poisonous than ether; indeed, whilst it required about 80 to 100 minims of ether to arrest the ventricle, one or two minims of chloroform were sufficient. I also found that ammonia and chloroform, ammonia and ether, ammonia and bromide ethyl, and ammonia and iodoform were mutually antagonistic, and that after the ventricle was arrested, or almost arrested, by chloroform, ethidene dichloride, ether, or iodoform, the addition of a small quantity of a solution of caustic ammonia would restore and strengthen the pulsations.

ETHER

THE physiological action and therapeutic uses of ether and chloroform are, for the most part, identical.

As a local anæsthetic in neuralgia, toothache, etc., ether is less frequently used than chloroform, one reason for which being its extreme volatility, whereby it rapidly escapes from the site of application.

In the form of spray, however, after the method introduced by Sir B. W. Richardson, this same quality of volatility is made use of, for ether is employed temporarily to abolish sensation of the skin by the rapid evaporation and consequent abstraction of heat which follows its applications; the volatilization freezes the tissues and annuls sensation. Ether spray is frequently used in minor operations, such as the opening of abscesses, the removal of small tumours, etc., and it has even been successfully employed in amputation of the leg, and in ovariotomy, but it is not generally available for operations so serious and prolonged. The skin or mucous membrane, when sufficiently frozen to permit of a painless operation, becomes pale, shrunken, tallowy-looking, and feels as if oppressed with a great weight. Whilst returning to the natural condition after the operation the *frozen* tissues tingle and smart, and sometimes so intensely as to exceed the pain of operation. The obvious advantage of the topical ether spray over chloroform inhalation is its perfect safety.

Freezing the skin with ether spray will sometimes remove sciatica or neuralgia, and permanently, but the relief in general is only temporary.[1]

Ether spray applied to the spine, at first every two hours, and then less frequently, is said to be useful in tetanus, and applied night and morning, it is highly commended in chorea.

Ether has a sweetish, hot, pungent taste, and it induces a sensation of warmth in the stomach. Like chloroform it may be taken in full doses to relieve biliary or intestinal colic. It increases the secretion from the stomach, intestines, and pancreas, and at the same time by stimulating the muscular coat it expels wind.

On account of its direct stimulant action upon the abdominal organs, in particular upon the alimentary tract, ether promotes powerfully, according to Binz, the action of preparations of iron in chlorosis.

After its absorption it stimulates the heart, and is hence employed in syncope and in the prostration of fevers, but as it is rapidly eliminated, by the lungs chiefly, its effects are transient and do not generally exceed an hour.

Full doses of ether will often act as soporifics. They are very useful in angina pectoris, sometimes giving even more prompt and permanent relief than nitrite of amyl. Ether is useful, also, in asthma.

It is sometimes employed hypodermically in heart failure from hæmorrhage or from prostrating disease, *e.g.* adynamic pneumonia, etc. Fifteen to thirty minims may be injected three or four times a day. The injection excites a burning pain with some swelling; this subsides, generally, in an hour or two, but sometimes suppuration follows. I have employed it in many cases of heart failure from various causes, with very little, and often without any, benefit. As a hypodermic in heart failure ether may be combined with other drugs —thus ether and tincture of digitalis. Of the latter ten, fifteen, or twenty drops. This use of digitalis will, however, require more careful regulating than that of ether alone, because its effects are more permanent. (*See* Digitalis.)

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[1] Dr. Debove employs methyl chloride condensed by pressure, to congeal the skin in neuralgia, especially in sciatica, and he claims to cure the patient, as a rule, after one or two applications. He congeals the skin over the area of pain, in some instances from the trochanter to the malleolus. This application freezes the skin much more readily than the ether spray, but it requires a special apparatus. He says it causes but little pain and no inflammation or risk of sloughing. I have employed this application in a few cases and with some success, but certainly with less than Dr. Debove's account led me to expect. Moreover, the application in all my cases produced considerable and somewhat enduring pain.

It has been employed in sciatica, the dose being injected in the neighbourhood of the painful nerve.

Ether is largely used as an inhalation to induce anæsthesia, and is preferred in most cases to chloroform, for ether has much less effect in depressing the heart and paralyzing the vaso-motor centres than chloroform. Like chloroform and alcohol it affects first the cerebral hemispheres, causing delirium and unconsciousness, next it paralyzes the spinal cord, and lastly it affects the cardiac and vaso-motor centres. It must, however, be given in larger doses than chloroform. A drawback to its use is that it excites the respiratory mucous membrane and may induce catarrh. It also greatly increases the secretion of saliva and mucus. In bronchitis, ether might, for these reasons, increase the respiratory trouble.

Dr. H. A. Hare has recently shown that prolonged etherization lessens considerably the body temperature. He has reduced the temperature by as much as 8° to 10° Fah. in animals, and in operations on man he has seen a fall of 4·4° Fah. Other anæsthetics, probably, produce the same effect. For this reason some surgeons wrap children in cotton wool, covering not only the body, but also the extremities, before giving the anæsthetic.

From a consideration of the whole subject it would appear that ether is a safer anæsthetic than chloroform. It possesses certain disadvantages; for example, it is more disagreeable, more slow in action, and it prolongs the stage of excitement, moreover it irritates the respiratory tracts. These, however, hardly outweigh its greater safety. The danger of giving ether in proximity to a flame must never be forgotten: the vapour is highly inflammable.

An anæsthetic mixture in considerable use is the so-called A C E mixture, which consists of one part of alcohol, two parts of chloroform, and three parts of ether. A favourite way of producing anæsthesia is to commence with a few whiffs of nitrous oxide gas and then to complete the narcosis with ether; this is much more agreeable than to use ether throughout and it is quite as safe.

HYDRATE OF CHLORAL

THIS compound is a chlorine derivative of aldehyde, as its name implies. Under certain conditions it splits up, yielding chloroform among the products; it is therefore closely allied, structurally, to the group we have just had, which includes both alcohol and chloroform.

Chloral hydrate was introduced into medicine by Liebreich; when added to an alkali it is decomposed by the aid of heat into chloroform and formic acid. This led to the employment of chloral, in the expectation that the alkali of the blood would slowly set free the chloroform. It appears, however, highly probable that although a small quantity may be thus decomposed in the blood, the bulk of it remains unchanged, and that its effects upon the system are due to the unchanged chloral hydrate. In support of the view that chloral is decomposed in the blood and acts as chloroform, several observers have obtained chloroform by distillation of the blood of animals poisoned by chloral; but, in all probability, the chloroform thus given off is derived from the chloral hydrate present in the blood by an act of decomposition by means of the heat used in the distillation, for Hammarsten found that on adding chloral to blood, and then passing carbonic acid through the mixture, he failed to obtain any chloroform, though on subjecting the mixture to distillation, chloroform was readily given off. Further, no chloroform is exhaled in the breath of those under the influence of chloral; and chloral hydrate is excreted as such in the urine.

Again, the effects of chloral differ qualitatively from those of chloroform, and in particular are more prolonged.

Chloral is antiseptic. Applied to the skin, it reddens and even blisters it when used in concentration. In the mouth it has a hot, pungent, disagreeable taste, which may, however, be considerably covered by syrup of orange-peel or syrup of ginger. It enters the blood quickly. Its most marked effect is sleep; after larger doses there is a lessened sensibility to painful impressions. It lowers blood pressure by dilating the blood-vessels through its action on the vaso-motor centres, and by a direct weakening of the heart. It first accelerates and then slows the pulse, but there is nothing very characteristic about the action on the rate of contraction of the heart; in toxic dose in man there may be a frequent, irregular pulse towards the end: a massive dose, by its effect on the cardiac ganglia, may arrest the heart. Upon the brain, and upon the spinal cord, it first produces a slightly increased activity, followed soon by depression, and even complete paralysis. In moderate dose it contracts the pupil; in larger dose, it first contracts and then dilates the pupil and greatly reduces the bodily temperature, as first shown by Dr. Brunton; this reduction of the temperature it effects mainly by an increased loss of heat through dilatation of the cutaneous vessels, in a lesser degree, probably, by a diminished heat formation. Large doses induce great muscular relaxation, abolish reflex action and sensibility, and the animal dies, sometimes through the loss of heat, sometimes by paralysis of respiration, or paralysis of the heart. Note then that the drug in full dose depresses the circulation, lowers the temperature, and diminishes nervous activity of brain, cord, and medulla.

The most characteristic effect of chloral is sleep, in part due, probably, to its direct action on the nervous structure of the brain, but in part also to the anæmia which it produces in this organ. Thus, Dr.

W. H. Hammond finds that at first chloral congests the retina, but in five or ten minutes the opposite condition commences, and continues till the retina assumes a pale pink colour. As the retinal circulation corresponds with the cerebral, he concludes that chloral affects the brain in the same way as the retina, and he has proved the correctness of this inference by means of an instrument called the cephalohæmometer, invented independently by himself and by Dr. Weir Mitchell. Dr. Hammond says, that while the brain is congested, there is some mental excitement, but that as the vessels contract, drowsiness supervenes, and upon this wearing off, the retinal and cerebral vessels enlarge till they resume their accustomed size.

Dr. J. H. Arbuckle (*West Riding Lunatic Asylum Reports*, vol. v.) finds that the following substances, Nicotia, Atropia, Hyoscyamia, Aconitia, Hydrate of Chloral, Nitrite of Amyl, Prussic Acid, Strychnia, Morphia, Picrotoxine, pushed even to a fatal dose, do not in any degree affect the circulation in the fundus of the eye. His observations were made on rabbits, and the results obtained were, in respect of some of these agents, confirmed by experiments on man; hence the statement, hitherto generally received, that the retinal circulation corresponds with the cerebral circulation, and that changes in the one always imply changes in the other, must be accepted with caution, unless, indeed, some of these drugs act on the brain in a manner opposed to the accepted theory, and do not influence it by affecting its blood supply.

Hydrate of chloral is chiefly employed to produce sleep. Chloral sleep is generally calm, refreshing, and dreamless, not too profound to prevent waking to cough, take food, etc. As a general rule, chloral causes no giddiness, headache, nervous depression, constipation, sickness, or loss of appetite. A patient roused from chloral sleep will eat a hearty meal, then lie down and immediately fall asleep again.

Sometimes chloral causes a good deal of heaviness and sleepiness on the following day, but this effect soon wears off. It occasionally produces frightful dreams, and sometimes much excitement, intoxication, and even delirium without sleep. Sleep comes on, sometimes in a few minutes, but more commonly in half an hour. Like other soporifics, it should be given shortly before bedtime, and the patient should avoid excitement, and keep quite quiet, else it may produce restlessness instead of sleep. It has been given for many months at a stretch, apparently without any bad results. Its effects sometimes wear off, but in a far less degree than is the case with opium. Sometimes instead of sleep it induces headache, excitement, or even delirium.

Chloral as a hypnotic has been found useful in a variety of circumstances. It subdues the sleeplessness of old people, and the wakefulness induced by excessive mental fatigue, succeeding sometimes, indeed, where opium, bromide of potassium, and other remedies fail. In delirium tremens it produces sleep, and calms delirium, but it is especially successful when administered at the onset of the symptoms, and may then often avert a serious illness. Large doses have been given, even *sixty* grains or more, repeated several times. Dr. Da Costa cautions against its administration to patients with a weak heart. Large doses have caused serious and even fatal results, and much smaller doses than the above should first be tried in order to ascertain how far the patient tolerates the drug: Da Costa advises its combination with opium. In paralysis of the insane, a full dose will induce sleep at night, and a moderate dose calm excitement by day. Dr. Macleod has given it daily for more than three months to the same patient without bad effect. It is used also in acute mania. It is conveniently administered to the insane in porter.

It is employed in puerperal mania, and in puerperal convulsions.

It is often employed in fevers, especially typhoid and typhus fever. In fevers it frequently happens that the sleep is broken or the patient cannot sleep at all. This sleeplessness rapidly exhausts the nervous system, hence ensues delirium, followed by twitching of muscles and picking of the bed-clothes. The want of sleep, together with the delirium, rapidly wear out the strength of the patient and soon the heart shows signs of weakness, the pulse increasing in frequency and losing in volume and firmness. The cardiac failure thus induced is, of course, very dangerous, and unless obviated may end in death. In such cases soporifics are eminently serviceable, for by inducing sleep they prevent or remove delirium, promote the appetite and assimilation, and sustain the strength, and, judiciously employed, often save life. They should be given early, if possible before the delirium sets in, and certainly before the heart has become weakened through want of sleep and delirium. For this purpose chloral is very valuable, often inducing a calm refreshing slumber from which the patient can be awakened to take food, and yet fall asleep again. But whilst fully recognising the great value of chloral hydrate, I am convinced that opium is in most cases still more valuable. I have often seen moderate doses of laudanum induce sleep where chloral has failed, or has induced disagreeable and dangerous excitement. Moreover, laudanum generally induces a gentle perspiration, most comforting and favourable to fever patients, and further, opium strengthens the heart, not merely by inducing sleep, but by its direct action upon that organ. Again, opium checks the diarrhœa of typhoid fever. The combination of laudanum (minims fifteen to twenty) with chloral hydrate (grains ten) is still more certain in its action.

In the sleeplessness or the dreamy, unrefreshing, broken sleep, due to worry, over-work, uterine derangement, or the menopause, chloral hydrate is often very useful. In such cases, however, I am convinced that bromides are more efficacious.

Chloral sometimes restrains the voluntary movements of chorea, but in many cases it is powerless. It is most useful in those cases where the violent movements render sleep impracticable, the want of sleep in its turn aggravating the choreic movements, till even deglu-

[illegible] may become almost impossible. In these urgent cases ordinary remedies like opium are useless and recourse must be had to sedatives. Large doses of chloral frequently repeated will often produce profound refreshing sleep, from which the patient wakes calmer and less convulsed. See Chloroform. Dr. Bowers considers that chloral is more valuable than chloroform inhalations, and he advises ten or fifteen grains every four or six hours.

Chloral is often useful in the convulsions of children. Given in dose sufficient to induce sound sleep of some hours' duration, the convulsions cease for the time being, and often do not recur when the child wakes. If the child cannot swallow, five grains given by the rectum will soon induce a deep sleep, and the convulsions will then cease, at least temporarily. A liquid injection will often be expelled during the convulsions, hence it is better to administer the chloral as a suppository, pushed up as far as the finger can carry it. Chloral is also very useful in uræmic convulsions, and in the frequently recurring convulsive seizures of the status epilepticus. Indeed, if given in a sufficient dose, it will suspend or arrest any kind of convulsion.

Some cases of tetanus have apparently yielded to chloral in large dose, and in some instances this drug has prolonged life and eased pain. Dr. H. C. Wood thinks that in the combined use of chloral, bromide of potassium and opium, along with the utmost possible support by food, we have the best means of combating tetanus. In strychnine poisoning, chloral and bromide of potassium are much recommended: it will be best to combine them and give in full and repeated dose.

Chloral is of considerable use in the treatment of whooping-cough: to a child of one year old it may be given in dose of one-half to one grain, every two hours.

A full dose of chloral is often useful in a paroxysm of asthma.

The shortness of breath which affects the emphysematous on catching cold often yields to chloral. When the dyspnœa occurs at night, a full dose (twenty-five to thirty grains), at bedtime, calms the breathing, and gives sound refreshing sleep. When the difficulty of breathing is continuous, small doses (two to six grains) should be given several times daily.

It is necessary to give chloral with caution to patients with emphysema and bronchitis accompanied by an obstructed circulation, manifesting itself in lividity and dropsy, for, in addition to drowsiness, an ordinary dose may produce muttering delirium and a notable increase in the lividity; these effects, often lasting several days (attributable possibly to the slow destruction of the drug in the blood), seem not to be due to any peculiarity on the part of the patient, as I have seen chloral produce these symptoms in a patient who had previously taken it with benefit.

E. Lambert recommends chloral in parturition in fifteen-grain dose, every quarter of an hour, till the patient falls asleep; he states that this treatment does not weaken the uterine contractions, while it prevents pain, and ensures calm repose after delivery. Dr. Playfair thinks that chloral acts far better than chloroform inhalation, as chloral does not lessen the strength of the contraction, whilst it greatly lessens the suffering. It is, moreover, chiefly applicable at a period when chloroform "cannot be used, that is towards the termination of the first stage, before the complete dilatation of the os." Under its influence the patient falls into a drowsy state—a sort of semi-sleep. Dr. Playfair gives fifteen grains, and repeats the dose in about twenty minutes, leaving its subsequent administration to circumstances.

Bouchut employs chloral hydrate to produce general anæsthesia in children. To children about seven he gives forty-five grains; and to children from two to five he gives thirty grains. Anæsthesia is complete an hour after the administration. The drug may be given by the rectum. Children bear chloral well. For such purpose we would urge, however, that chloroform will be both safer and more efficient.

Five grains of chloral given twice or thrice daily will often remove a condition of frequent occurrence characterized by restlessness, irritability, and nervousness—a condition of ceaseless misery.

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Chloral is very inferior to opium as a narcotic for the relief of pain, and therefore, in painful affections, opium or morphia must be used, for chloral will often fail.

Dr. Bradbury and Dr. Thompson speak very highly of the efficacy of chloral in the nocturnal incontinence of children.

Liebreich recommends chloral in sea-sickness: fifteen to thirty grains should be taken every four hours. It is sometimes useful in the vomiting of pregnancy.

If too long continued, chloral may cause disagreeable symptoms: capricious appetite, impaired digestion, deficient secretion of bile, depression, nervousness, irritability, sleeplessness, and even slight paralysis, symptoms which soon disappear on leaving off the drug. Redness, injection and ecchymoses of the skin have been observed in some cases.

As we occasionally meet with persons who display an idiosyncrasy in respect of chloral hydrate, it is wise at first to give only a moderate dose, say ten to fifteen grains. Large doses, we have seen, weaken the heart, and we are therefore often cautioned against giving chloral where the heart is weak, other hypnotics, such as paraldehyde, being recommended in its place, but in the moderate doses of fifteen to twenty-five grains I have never seen it produce any depressing effect on the heart. The large doses, recommended by some writers in delirium tremens, must, of course, be given with caution, indeed I believe had better not be given at all: other soporifics should be tried instead.

Chloral is the antidote to strychnine, physostigmine and picrotoxine, that is to say, given the known minimum fatal dose, or rather, more than fatal dose, of one of these substances, chloral will either prevent death or greatly modify the symptoms induced by these several poisons (*see* Strychnine and Calabar-bean). Liebreich asserts that strychnine is an antidote to chloral. Dr. Levinstein reports the extraordinary case of a man, aged 35, who was poisoned by six drachms of hydrate of chloral. When first seen, he lay in a profound sleep, with congested face, heavy breathing, and pulse of 100. An hour after the poisoning he became livid, the veins were distended, the respirations were intermittent, and his temperature was 103° Fah. An hour and a half after the dose he became pale, pulseless, with contracted pupils, and his temperature had sunk to 91·2°. Nitrate of strychnine, enough to produce twitching, was then injected hypodermically, and the heart at once began again to beat, and the thermometer marked 91·9° Fah.; collapse, however, returned in a few minutes, the circulation appearing to stop. Artificial respiration was performed and nitrate of strychnine again injected, again with the same result. In ten hours, the pupils responded to light; in twelve, the temperature was 100·4°; in twenty-four hours, he could be roused; and after thirty-two hours, he awoke "quite refreshed," and did not complain of any gastric disturbance.

The urine of chloralized animals contains no sugar. Eckhard finds that chloral prevents the appearance of sugar in the urine after the diabetic puncture of the floor of the fourth ventricle. Even after severe injury to the vermiform process, diabetes was absent. Chloral hydrate also prevents the diabetes inducible in animals by reflex action, such *e.g.* as irritation of the central end of a cut vagus.

Chloral hydrate is sometimes used locally; it is, as we have said, antiseptic, and is recommended highly as a topical application in diphtheria. Some use a saturated solution in glycerine.

More commonly the use of chloral, locally, is a case of mixed therapy; thus when equal parts of chloral and powdered camphor are rubbed together, they form a syrupy liquid, which, painted over or gently rubbed into the affected part, often affords relief in neuralgia. My friend, Dr. George Bird, has used this preparation in several cases of neuralgia and pleurodynia, and with great success. I have known it cure promptly neuralgia of the inferior dental branch of the fifth, and neuralgia in the temporal region. It is said to relieve toothache, in many cases, even when applied externally, and I have known it succeed when put into the cavity of a carious aching tooth; but, like other applications in neuralgia, it often fails without apparent cause, and in cases very similar to others which it has previously benefited. When it does answer, this liniment generally affords almost instantaneous relief. I have known it give relief in severe pleurodynia.

A mixture of menthol and chloral hydrate, equal parts, also yields a syrupy fluid; it is equally, if not more, efficacious than the above chloral camphor, as a local anodyne.

In certain cases it would seem, either that chloral has deteriorated by keeping, or that an inferior article is at times supplied, for on obtaining a fresh supply from a reliable source, the effect, till then wanting, has at once appeared.

CHLORALAMIDE, Etc.

Several derivatives of chloral have been introduced into medicine as substitutes for chloral hydrate, such are chloralamide, chloralimide, chloralose, also compounds of chloral with caffeine, with urethane, etc. From this list we need only select chloralamide, also called chloral formamide.

Chloralamide is obtained by the interaction of chloral (not the hydrate) and the amide of formic acid. As the name implies, there is present in the molecule the grouping NH_2 (amidogen). To the presence of this grouping is perhaps due, as is claimed, the more stimulant or rather less depressant action of the drug. It occurs in colourless crystals, soluble in about twenty parts of cold water, freely soluble in spirit and in weak spirituous solutions; the taste is slightly bitter. Heat tends to resolve it into its components, and alkalies break it up. It is administered in the dose of 15–45 or 50 grains, and best in weak alcoholic solution as vehicle. The solution must not be heated, and alkalies are incompatible with it. A good formula will be:—Thirty grains of chloralamide with one tablespoonful of whisky or brandy, and two or more drachms of syrup of orange or other flavouring syrup, liquorice, etc.; this to be taken as a draught in half a wineglassful of water, more or less. The dose may be repeated, if necessary, in two or three hours' time. On an average chloralamide takes effect in about an hour.

Upon the action of this drug a large body of experience has been accumulated by a number of observers, both abroad and in this country, and the general verdict is that it does not depress the heart or circulation, or lower the temperature, that it exerts a decided action in many cases of insomnia from pain, and that after-effects and by-effects are rarely witnessed. At the same time it must be admitted that collapse symptoms have been observed in a few cases and certain erythematous eruptions. It is certainly a valuable hypnotic.

It would appear that chloralamide may with advantage be combined with potassium bromide, fifteen grains of each to the dose, in weak spirituous solution. Such a combination of equal parts of these two drugs is sold under the name Chlorobrom. It is used in insomnia; it has also been much praised in sea-sickness and gastric irritability generally.

PARALDEHYDE

THIS substance, a polymeric modification of aldehyde, was introduced into medicine as a hypnotic by Cervello, of Palermo, and, among others, Moselli, Popoff, Desnos, and Leech in this country have contributed valuable papers on its action.

Since the last edition of this book the value of the drug as a soporific may be said to have been established. The special advantage which it offers over chloral hydrate is that it produces its effect with very little, if any, appreciable depression of the heart. Its action is rapid, sleep generally obtaining in from five to twenty minutes (Dujardin-Beaumetz). The sleep is quiet of its kind, and closely resembles physiological sleep; it lasts from two to six hours, and the patient awakes from it refreshed, without headache or confusion of ideas. Sometimes, before inducing sleep, it causes slight excitement; this is one of its disadvantages.

Paraldehyde shows the generic action of the alcohol group, paralyzing first the brain, then the spinal cord, and then the medulla oblongata. If the dose be a fatal one, death takes place at the lungs, the action upon the circulation being relatively slight. These statements hold for large doses; small doses, on the other hand, may, at any rate in the first stage, increase the excitability of the cortex of the brain.

The peripheral structures, motor and sensory nerves, and muscle fibres are practically unaffected. As stated, the action on the heart is comparatively slight, but it does not wholly escape, and a massive dose may cause distinct weakening with lowered blood-pressure, and ultimately there may be arrest of the heart in diastole.

According to Quinquaud and Hénocque the blood-colouring matter is affected by paraldehyde, methæmoglobin being produced, but Hayem disputes this (Dujardin-Beaumetz, *Nouvelles Médications*). A roseolous rash is sometimes produced.

Paraldehyde has little influence over pain, even less than chloral (Loebisch).

Paraldehyde is excreted in part by the breath, and the peculiar ethereal odour which this acquires constitutes a drawback.

The drug may be administered for long periods and in large dose without producing obvious harmful results, but exceptionally it may cause symptoms resembling those of chronic alcoholism. Krafft-Ebing reports such a case. As an example of its toleration we may instance the case of a woman at an asylum, who received with benefit a nightly dose of ten drachms. This also exemplifies the fact that patients rapidly grow accustomed to it. If there is irritability of stomach, *e.g.* in phthisis or ulcer of the stomach, the drug is not very well borne, and may excite nausea and vomiting.

It has been said to cause diuresis by some observers, but others have failed to observe any action upon the kidneys.

The drug has been extensively used in asylum practice, and it is highly praised by such authorities as Krafft-Ebing, Keraval, Nerkam, Clouston, Strahan, and others. It is given in the sleeplessness of mania, and of chronic forms of mental weakness, also in hysterical excitement.

The dose may be set at forty-five minims to one or two drachms. Clouston sometimes advances the dose to three or four drachms. In ordinary asylum practice Strahan advises that a first dose of forty-five minims to a drachm should be followed by a similar dose, if sleep do not set in in five minutes. Per rectum it may be administered in dose of one to two and a half drachms.

The chief practical objection to the use of paraldehyde is its most unpleasant taste. It has been recommended that it should be taken in olive oil flavoured with some volatile oil, *e.g.* peppermint, or in a mucilage also flavoured with orange-peel, etc., or in the form of grog with some acceptable flavouring; but all difficulties on the score of taste can be got over by giving it in capsules—each to contain thirty to forty-five drops.

I have only compared the effects of paraldehyde with those of chloral hydrate in moderate doses. For instance, I have very rarely exceeded twenty to twenty-five grains of chloral. In these quantities I have not yet met a case of fever or of heart disease at all depressed by chloral hydrate, hence tition may become almost impossible. In these urgent cases ordinary remedies like arsenic are useless, and recourse must be had to sedatives. Large doses of chloral, frequently repeated, will often produce profound refreshing sleep, from which the patient wakes calmed and less convulsed. (*See* Chloroform.) Dr. Gowers considers that chloral is more valuable than chloroform inhalations, and he advises ten or fifteen grains every four or six hours.

Chloral is often useful in the convulsions of children. Given in dose sufficient to induce sound sleep of some hours' duration, the convulsions cease for the time being, and often do not recur when the child wakes. If the child cannot swallow, five grains given by the rectum will soon induce a deep sleep, and the convulsions will then cease, at least temporarily. A liquid injection will often be expelled during the convulsions, hence it is better to administer the chloral as a suppository, pushed up as far as the finger can carry it. Chloral is also very useful in uræmic convulsions, and in the frequently recurring convulsive seizures of the status epilepticus. Indeed, if given in a sufficient dose, it will suspend or arrest any kind of convulsion.

Some cases of tetanus have apparently yielded to chloral in large dose, and in some instances this drug has prolonged life and eased pain. Dr. H. C. Wood thinks that in the combined use of chloral, bromide of potassium and opium, along with the utmost possible support by food, we have the best means of combating tetanus. In strychnine poisoning, chloral and bromide of potassium are much recommended: it will be best to combine them and give in full and repeated dose.

Chloral is of considerable use in the treatment of whooping-cough; to a child of one year old it may be given in dose of one-half to one grain, every two hours.

A full dose of chloral is often useful in a paroxysm of asthma.

The shortness of breath which affects the emphysematous on catching cold often yields to chloral. When the dyspnœa occurs at night, a full dose (twenty-five to thirty grains), at bedtime, calms the breathing, and gives sound refreshing sleep. When the difficulty of breathing is continuous, small doses (two to six grains) should be given several times daily.

It is necessary to give chloral with caution to patients with emphysema and bronchitis accompanied by an obstructed circulation, manifesting itself in lividity and dropsy, for, in addition to drowsiness, an ordinary dose may produce muttering delirium and a notable increase in the lividity; these effects, often lasting several days (attributable possibly to the slow destruction of the drug in the blood), seem not to be due to any peculiarity on the part of the patient, as I have seen chloral produce these symptoms in a patient who had previously taken it with benefit.

E. Lambert recommends chloral in parturition in fifteen-grain dose, every quarter of an hour, till the patient falls asleep; he states that this treatment does not weaken the uterine contractions, while it prevents pain, and ensures calm repose after delivery. Dr. Playfair thinks that chloral acts far better than chloroform inhalation, as chloral does not lessen the strength of the contraction, whilst it greatly lessens the suffering. It is, moreover, chiefly applicable at a period when chloroform "cannot be used, that is towards the termination of the first stage, before the complete dilatation of the os." Under its influence the patient falls into a drowsy state—a sort of semi-sleep. Dr. Playfair gives fifteen grains, and repeats the dose in about twenty minutes, leaving its subsequent administration to circumstances.

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taking effect at all during the night, but causing much somnolence the next day, or may be even later.

Various toxic symptoms arise occasionally, *e.g.*, fulness in the head, giddiness, slight difficulty of speech, slight ataxia; a few cases of rash, scarlatiniform or measly, have been observed. Toxic symptoms may follow very large doses, but more commonly they occur from the prolonged use of sulphonal. By such continued use there may arise not only a habit or craving, but a really serious train of symptoms, marked by emaciation, great physical weakness, tottering gait, thickness of speech, mental incapacity (especially slowness of thought), delusions; with this there may be alimentary tract disturbance, anorexia and irritability of stomach. In such cases the urine may show a deep-red discoloration due to the presence of hæmatoporphyrin, a decomposition-product of the blood. In some cases of sulphonal poisoning the kidneys have shown signs of a nephritis.

These facts all indicate the importance of the controlled use of sulphonal; carefully kept in hand, as all soporifics should be, it is a very valuable remedy.

TRIONAL AND TETRONAL

VERY closely allied to sulphonal in chemical structure are the compounds trional and tetronal; in the former a methyl group is replaced by an ethyl group, in the latter there are two such replacements. Adopting the same terminology for sulphonal, it should be called dional; but the objection to this would be, that it would imply that there is truth in the theory that the activity of these bodies stands in special relation to the ethyl groupings. Trional and tetronal are very similar to sulphonal in their action. Sleep is said to be produced more promptly by them, and that fewer by- and after-effects result, but though they have been fairly tested, it is doubtful whether they can be said to possess any real advantage over sulphonal, and already there are a fair number of records of after-effects like those caused by sulphonal. Certainly both trional and tetronal may be substituted for sulphonal on occasion, if the last fails or is not available, and trional has the advantage of being rather more soluble than sulphonal, but on the other hand, both it and tetronal have a somewhat bitter taste, a drawback as compared with the tastelessness of sulphonal.

OTHER HYPNOTICS

THE list of hypnotics is continually and rapidly extending, but with Opium and its derivatives, Indian Hemp and its derivatives, with Henbane and its alkaloids, with the Bromides, Alcohol, Chloral Hydrate, Chloralamide, Paraldehyde, Sulphonal, and its variants Trional and Tetronal, it may be said that we possess a sufficiently work-a-day list, and that the use of these or combinations of these may for the present suffice. For the less used soporifics Hypnone, Hypnal, Methylal, Amylene Hydrate, etc., we may refer to special treatises, also our article, "Sedatives," Tuke's *Dictionary of Psychological Medicine*.

HYDRATE OF CROTON-CHLORAL OR BUTYL CHLORAL HYDRATE

JUST as chloral hydrate is a derivative of ethylic alcohol, so in precisely the same way butyl chloral hydrate is a derivative of butylic alcohol. The two derivatives stand in exactly the same position to their respective alcohols. Butyl chloral hydrate has hypnotic powers, but it is so rarely used for this purpose and so much for other purposes, that on practical grounds it should be dissociated from the group of hypnotics in spite of many structural and other affinities.

We are indebted to Dr. Oscar Liebreich for the introduction of this valuable agent into practical medicine. This distinguished experimenter finds that in animals it produces anæsthesia of the head without loss of sensibility of the rest of the body; in man, the anæsthesia is confined to the area of the fifth nerve. In large doses it produces sleep, and in fatal doses it destroys by paralyzing the medulla oblongata. He recommends it in trigeminal neuralgia, but speaks of it as affording only temporary relief; he, however, greatly underrates its efficacy.

Croton-chloral is, perhaps, the most efficacious remedy in facial neuralgia. In neuralgia due to carious teeth; in the facial neuralgia of old people, in whom the disease is generally most obstinate and severe, it is alike beneficial. In the few cases of that severe form of the disease called epileptiform tic in which I have had the opportunity of using it, it has proved useless, even in large doses. I have found it very serviceable in neuralgia of the back of the head, and also in that of the neck with pain radiating to the shoulders.[1] There is but little evidence at present of its value in neuralgia of other parts of the body, though it is reported to have cured several severe cases of dysmenorrhœal neuralgia. I have not found it successful in neuralgia of the trunk and extremities. In facial neuralgia I have long employed with great benefit three grains of croton-chloral hydrate with $\frac{1}{200}$ grain of gelsemine, administered every quarter of an hour for six or eight doses and then hourly.

I have found hydrate of croton-chloral very useful in migraine, commonly called sick headache, bilious headache, nervous sick headache, and hemicrania. The most characteristic and commonest symptoms of megrim are headache and sickness, but in a typical case these symptoms are preceded by other significant and interesting phenomena. At the onset of an attack, a peculiar affection of the sight occurs, soon to be followed by perversion of the sense of touch and of the muscular sense in the arms and legs, and further by disordered speech and defective ideation; the headache then comes on, and, as it becomes intensified, nausea gradually sets in.

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[1] These latter regions are, of course, not supplied by the fifth nerve.

The affections of the sight may consist of a mere absence of vision beginning at the centre or circumference of the visual field. When at the circumference, the defect is generally situate to the right or left of the axis of vision. From the centre of the visual field, the blind spot gradually expands, and as it enlarges it clears up in the centre, and so gradually works its way to the circumference. As the blind spot expands, its margin is often lighted up by spectra variously described as glimmerings, dazzlings, bright zigzag lines, corruscations, etc.

In from ten minutes to half an hour, numbness and loss of sensibility appear on one or both sides of the body, which are followed by tingling, formication, "pins and needles," felt most distinctly in the hands, tongue, and lips. Speech is frequently disordered, the aberration in some cases being simply memorial, in others simply motorial; in others, again, these two derangements of speech are more or less combined. In other words, one patient forgets his words, another forgets how to utter them, whilst a third manifests a combination of these two defects. There is, also, loss of memory, confusion of ideas, and a bewildering feeling, as if the patient were going out of his mind. In half an hour or a little longer, these phenomena are followed by headache, which indeed to some extent is generally present on waking in the morning, but which now suffers a notable increase: it is at first slight, but intensifies till it may become most severe—indeed almost unbearable. It affects one or both brows, and, beginning at one spot gradually extends, till it may involve the greater part of the head. The throbbing, stabbing, cutting, boring pain is increased by movement, noise, light, smells, or food. When the area of pain is limited, the complaint is termed clavus. As the pain subsides, or even during the whole attack, the patient may suffer dull or shooting pains in the eye of the affected side. There is much tenderness of the scalp during and after the attack.

Throughout the attack the patient complains of nausea, which may be slight, but usually increases, and when the pain is at its worst, ends in vomiting, which may be severe and prolonged, causing much prostration; occasionally vomiting affords relief.

Lasting a few hours, the whole day, or even two or three days, the attack generally ends in calm refreshing sleep; sometimes it subsides gradually, sometimes it ends abruptly in vomiting, perspiration, or more rarely, a copious flow of tears. The attack may be preceded and followed by very obstinate constipation or by diarrhœa, the liquid motions being in some instances pale, in others of a deep brown mahogany colour. Before and after the attack, there is often much dusky discoloration around the eyes.

Dr. Liveing, to whose exhaustive work I am considerably indebted, considers that, in a typical case, the disturbance takes place first in the optic thalamus, and passes backwards and downwards, reaching to the nucleus of the vagus below; for, as he observes, in a model seizure the visual disorder is always the initial, the headache the middle, and the vomiting the final symptom. Where morbid intellectual phenomena and disorders of speech occur, the affection radiates from the thalamus to the hemispheric ganglia, and where emotional phenomena occur, to the mesencephalon.

Other observers regard the affection as seated in the cilio-spinal axis, and to be of two forms, one depending on stimulation, the other on paralysis of this part. When due to stimulation the temporal artery is small and hard, the eye is prominent, the palpebral fissure more widely open, the pupil dilated, and the skin of the face pale; when the attack is paralytic the opposite of these symptoms occur.

Though the affection is seated in the nervous centres, yet it must be recollected that both the frequency and the severity of the attacks depend on peripheral exciting causes, due to the stomach, intestines, liver, womb, etc. Even when the affection is strongly developed and the periodic attack occurs apparently spontaneously, remote exciting causes may render the seizures more frequent and severe; in other cases, the affection or tendency may be so slight, that it lies dormant till roused into activity by some near or distant irritation; this being removed, the seizures cease.

The successful treatment of megrim depends less upon changes to be effected in the disordered nervous centres than upon the removal of the exciting cause. The treatment of megrim falls therefore into three divisions:—

1. The treatment of the central nervous condition.
2. The removal or prevention of the exciting cause.
3. The treatment of the paroxysm.

Many remedies act in a twofold or even a threefold way. Thus bromide of potassium is often extremely serviceable in the following ways: it is very useful, *e.g.* in cases where the seizure is due to uterine disturbance, as in cases of menorrhagia and dysmenorrhœa; next that it is serviceable when the attacks are more severe and frequent owing to an exhausted state of the nervous system. This last may perhaps result from overlong town residence, or from mental troubles, but whatever the cause the patient becomes irritable, depressed, nervous, excitable, and there is broken sleep, harassed by dreams: the ensuing general depression increases the headache. Now, in such a condition of things bromide of potassium soothes the patient by promoting refreshing sleep, and in this way it lessens the frequency and severity of the headaches. Lastly, bromide of potassium is directly serviceable in the paroxysm itself, for it may produce several hours' sleep, from which the patient awakes free from headache.

The pain of megrim is situated in the area of the fifth nerve; and remembering how closely megrim is allied to neuralgia, and how useful hydrate of croton-chloral is in facial neuralgia, I have been induced to try this remedy for megrim, and I have found it useful in cases of which the following may be taken as a type:—

A woman has been subject, for years perhaps, to nervous sick headache; then, owing to some great trouble, or to excitement, fatigue, or flooding, or prolonged suckling, or more often, still, to the "change of life," the headache becomes much more severe, and may be continuous for weeks, perhaps months, and be intensified greatly by fatigue, or excitement, or at the catamenial period. In such a case, though not actually continuous, the headache may come on daily, and last many hours perhaps, or several attacks may occur each day. The pain complained of is often intense, and whereas previous to the oncoming of this intensified form of headache, the pain was probably limited to one brow, it now affects both, and perhaps the greater part of the head. The skin over the area of pain is generally very tender. There may also be a sensation of bewilderment, or, as some term it, a stupid headache, the patient saying that she feels as if she should "go out of her mind." The sight may be dim, especially during the exacerbations of pain. Some patients of this class are very excitable and irritable, and are upset by the slightest noise. Nausea and even severe vomiting may occur with each exacerbation of the pain. In most cases of this kind five grains of croton-chloral every three hours, or even oftener, will give considerable relief. I need hardly say that the drug does not entirely free the patient from her attacks, but within one or two days the pain will cease to be continuous, and though the attacks still recur, it will now be only once or twice a week, the interval gradually extending till it may take place only every fortnight, or at even longer intervals, the illness resuming then its old type and periodicity. In some cases, a week's treatment suffices to bring back the headache to its original type of an attack once every three or four weeks. At this stage the croton-chloral appears to be far less serviceable, manifesting but slight influence over the periodical attacks. However, in many cases of ordinary periodical headache, the patients do say that in the milder forms the drug distinctly lessens the severity and duration, though in the severer forms it may be without effect, even when sickness is absent. In cases accompanied by severe vomiting and retching, croton-chloral is useless because speedily rejected. Croton-chloral will, I have found, relieve the lighter attacks of headache which some delicate and nervous women experience after any slight fatigue or excitement.

In the continuous sick headache above described, as the pain grows less so the cutaneous tenderness disappears, and it has seemed to me that, in many instances, two kinds of headache co-exist, sometimes one, sometimes the other, predominating. The one headache appears to be due to affection of the cutaneous nerves, or to involve these, and to be generally accompanied by tenderness of the scalp. The other headache patients describe as a "stupid headache," "a feeling of bewilderment," "a bewildering headache," and this pain is probably more deeply situated. After the dispersion of the first form by croton-chloral the "stupid headache" will often continue; it is generally relievable by bromide of potassium, indeed, in many cases, I have found it useful to combine these remedies. Bromide of potassium alone is often sufficient in certain sick headaches; for instance, in those cases in which other symptoms point to the use of this drug, as, *e.g.* when, in addition to the bewildering or stupid headache, the patient complains of broken sleep, attended by disagreeable or frightful dreams, of being very irritable and excitable, or of feeling as if he or she should "go crazy." Bromide of potassium, also, as has been mentioned, is often useful where the continuous or almost continuous form of sick headache is associated with, and is probably due to, uterine derangement, such as menorrhagia. The drug's efficacy, here, is not due to simply checking the loss of blood, and so indirectly improving the health, for its value is manifest before the occurrence of the next flooding. In cases of this kind it may be usefully combined with cannabis indica.

In the treatment of the paroxysm itself, salicylate of soda, and antipyrin, and allied drugs, have now quite superseded croton-chloral.

I have already referred to the effect of croton-chloral on the shooting pains in the occipital and auricular nerves, but I wish again to revert to them, because they appear in many cases to be closely allied to migraine, being often induced by the same circumstances. Thus, they are most common in women, especially when they are in depressed health or subject to worry. Sometimes, again, the attacks are associated with nausea, or even sickness. The pains occur in short stabs running along the course of the nerve fibres, not in enduring paroxysms. Croton-chloral in such cases is often very useful, although it may fail if the health is greatly depressed, or there is much anæmia. Sometimes the symptoms indicate by preference the employment of bromide of potassium.

Liebreich, who recommended croton-chloral as a soporific, and gave as much as sixty grains for a dose, thinks it superior to hydrate of chloral, since whilst it produces sleep it does not affect muscular tone, or interfere with the circulation or respiration. He thinks it applicable in cases of heart disease. Much smaller doses than those just mentioned are said to produce sleep, thus Dr. Yeo states that sometimes two grains will suffice. I have given five and ten grain doses in a considerable number of cases, but never knew either dose to produce sleep or even drowsiness.

Croton-chloral is best administered in pill. Three grains every quarter of an hour for an hour or an hour and a half, and then hourly, will generally relieve neuralgia without causing any toxic symptom. Much larger doses may be given, *e.g.* ten grains several times a day. The drug is of little use in toothache, unless this has induced neuralgia, in which case it cures the neuralgia, but leaves the toothache unaffected.

IODOFORM

THIS compound is the equivalent of chloroform, three iodine replacements being substituted for three of chlorine in the molecule of marsh gas. On this account it might well have been placed next to chloroform; moreover, iodoform is possessed, like chloroform, of anæsthetic and antiseptic powers. But whereas in the latter anæsthetic powers predominate, or, at least, are made chief use of by us, the former, iodoform, is most employed for its powers as an antiseptic, its action as an analgesic playing a subordinate though useful part.

Iodoform then is used locally as a disinfectant and antiseptic, also, in minor degree, as an anæsthetic; it is also administered internally for its effects after absorption, here it will act probably by virtue of the iodine it contains. It contains as much as ninety-seven per cent. of iodine.

Iodoform is a healing and soothing application to spreading and sloughing sores, such as bed-sores, rodent ulcers, and, especially, soft chancres; it is said to prevent buboes. It is also very useful in syphilitic and scrofulous ulcerations. The sore dusted over with iodoform should be covered with some bland application, such as glycerine spread on lint. Its action in chancrous and syphilitic ulcerations is often prompt. In syphilitic sores the following formula is very useful: iodoform, 1 part; oil of eucalyptus, 15 parts. It has been successfully employed in ulcerations of the nose and throat and in chronic ozæna. Dr. Moleschott uses it as an ointment, 1 part in 15, for enlarged scrofulous or simply inflamed glands in orchitis. It relieves the pain of cancerous sores. When employed in uterine cancer, a bolus containing from eight to sixteen grains made up with cocoa-nut fat is inserted into an excavation produced by sloughing or ulceration. An iodoform suppository is also useful in painful diseases of the rectum and bladder.

Dr. Munday recommends iodoform highly as an antiseptic dressing on the battle-field.

Dr. Tanturri recommends an iodoform ointment of strength ʒj. to ℥j. for prurigo. Iodoform is useful in lupus, and should be dusted several times a day on the ulcerated surface. An ointment composed of iodoform four grains, oil of eucalyptus one drachm, vaseline one ounce, is highly recommended in eczema.

Iodoform is said to relieve the pain of neuralgia and of gout. A saturated solution of iodoform in chloroform has been advised in neuralgia.

Iodoform emulsion in glycerine, or in glycerine and water 1 in 10, is used for injection into abscess cavities, sinuses, etc.

One would expect that iodoform, either given internally or inhaled, would act like alcohol, chloral, and chloroform, and this is true in some measure, for it is able to produce sleep and some anæsthesia. Owing to the large quantity of iodine which it contains, it also shows, when applied topically and when given internally, the action, to some extent, of free iodine.

In certain ways, however, it differs very decidedly from free iodine in its action, and particularly in respect of its local action, which instead of being irritant is sedative rather. Accordingly, though containing a large quantity of iodine, iodoform is not very irritating to the stomach. In large doses it produces a kind of intoxication followed by convulsions with tetanic spasms, high fever, mental depression, dilatation of the pupil, involuntary evacuations, hallucinations, sometimes sudden collapse and death.

It has been employed internally in secondary and tertiary syphilis.

When topically applied, iodoform may occasionally produce serious symptoms due to absorption. These may be of three kinds :—

1. Coated tongue, loss of appetite, sickness, and sometimes diarrhœa.

2. Rapid feeble pulse, 140 per minute, irregular perhaps, with other evidences of heart failure.

3. Delirium, active and furious, with hallucinations, or melancholia, with loss of memory; coma may ensue, and, not uncommonly, convulsions and paralysis.

These symptoms may be transient, or they may persist for weeks; they may destroy life.

In children these symptoms rarely occur; the aged are much more liable to them; debility favours their occurrence.

Iodoform has a depressing action on the heart, and upon frogs this action may be demonstrated by arrest of the heart in diastole; probably this action is upon the nervous ganglia.

In fatal doses iodoform produces fatty degeneration of the liver, kidneys, heart, and voluntary muscles, acting thus like chloroform and ether.

Ten-grain doses of potassium bicarbonate, given hourly, are said to remove these poisonous effects.

Iodoform is eliminated by the breath as such, and by the urine as iodide and a little iodate. Large doses may cause hæmaturia and albuminuria, and after death we may find glomerular nephritis. It is said also that, centrally, it may excite acute polio-myelitis.

Its local application having caused several deaths, it is now used less indiscriminately than formerly; if used in moderation, there appears to be little or no risk.

It is employed internally in doses of one to four grains, and is generally indicated where iodides are useful. Dr. Bartholow recommends it strongly in catarrhal jaundice, and in cirrhosis, especially the hypertrophic variety, if the disease is not too far advanced. He believes cirrhosis may be cured by the persistent use of iodoform in moderate doses.

According to some observers it is also useful in phthisis in doses of six or eight grains, with extract of gentian, daily. Dr. Dreschfeld confirms this statement, and finds that iodoform increases appetite and weight, diminishes cough, expectoration, and night sweats, and sometimes even lowers the febrile temperature. Other observers confirm this, and administer it in pills to the extent even of fifteen grains *pro die*. Foxwell, of Birmingham, records larger dosage without hurt. Shingleton Smith also speaks well of iodoform, internally, in phthisis; his dosage is from 1–5 or 6 grains five times daily (Burney Yeo). Yeo speaks well of the administration of iodoform in cod-liver oil in the proportion of ½ grain to 2 drachms of oil (this will mean a very small iodoform dosage). He also recommends it mixed with guaiacol in capsules. Iodoform is liable to cause gastric upset; this constitutes a difficulty in its administration.

It appears to be useful, also, in phthisis, when administered by spray, or as an inhalation. Rummo and others highly recommend a four per cent. solution of iodoform in spirits of turpentine, as an inhalation or spray in phthisis and chronic bronchial catarrh, to lessen cough, expectoration, and fever. It is also applied as an insufflation in tubercular laryngitis.

Thus for the most part the use of iodoform is a local one, though the value of the drug internally, by way of absorption, appears to be of considerable importance, especially in phthisis.

The local action is antiseptic, this is clearly established clinically, but, strangely, the same results are not obtainable in the laboratory, for iodoform comports itself here with great indifference towards the germs of anthrax, of erysipelas, of pneumonia, of tubercle, etc. The discrepancy is sought to be explained according to the theory that in wounds, etc., the iodoform is split up in the presence of these germs and, liberating iodine, acts antiseptically, in other words, that iodoform acts only as an antiseptic in the act of decomposition.

IODOL

TETRA-IODOPYRROL contains eighty-nine per cent. of iodine, and is employed in place of iodoform, having the great advantage over it of being free from smell. It is insoluble in water, is slightly soluble in dilute alcohol, but freely in strong alcohol and ether; in fatty oils it dissolves in the proportion of 1 in 15. Like iodoform it is antiseptic and anæsthetic, and it appears, when applied locally, to be much less poisonous than iodoform; one case, however, of poisoning published in 1887 proves that it may be decidedly toxic. Dusted on sores, it prevents suppuration, and cleans gangrenous wounds, and so promotes healing. It can be employed as an alcoholic or ethereal solution, 1 in 16, or as an ointment, five per cent., or as a medicated gauze. It is highly useful as an application to syphilitic and chancrous sores. Internally administered in two to four grain doses, several times a day, it is useful in secondary syphilis.[1] The pure powder applied by insufflation is useful in tubercular ulceration of the larynx.

It is slowly absorbed by the stomach, and iodine then speedily appears in the saliva and urine. H. C. Wood suggests that the slower absorption of iodol accounts for its lesser toxic action when applied locally. It is eliminated as an iodide.

Given in large doses to animals it causes them to emaciate and die, and, post mortem, fatty degeneration of the organs is found, in particular of the liver and kidney.

In the above-mentioned case of poisoning from a local application it acted like iodoform, inducing fever, a rapid, small, irregular pulse, and vomiting. Although all the application was removed, iodine was detected in the urine for two weeks. Like iodoform, it is more slowly absorbed and eliminated than iodides.

Iodol and iodoform must be regarded as closely resembling each other in mode of action. Both, apparently, act as sources of iodine which they more or less slowly disengage in contact with the living tissues, so slowly that, at any rate, they show little, if any, signs of local irritation. Iodol appears to be the milder drug of the two; this may depend upon a slower reaction between it and the tissues.

These two compounds may sufficiently represent a large group of iodine substitution-products which have been recently introduced. Such are: sozoiodol, and various combinations of this with the heavy metals, the metals of the alkalies and with ammonium; iodo-salicylic acid, diiodo-salicylic acid, aristol, etc. These bodies severally contain iodine in weaker but varying proportions, also in more or less stable combination. (Consult Helbing's *Modern Materia Medica*; Martindale's *Extra Pharmacopœia*.)

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[1] Larger doses, up to thirty or forty grains, *pro die*, have been given.

NITRITE OF AMYL

To Dr. Brunton belongs the distinction of first using this remedy, and the rare merit of correctly inferring its therapeutic effect from its physiological action. It must give him the highest satisfaction to know how great a boon his scientific insight has provided for the hitherto almost helpless patients under the anguish of angina pectoris.

Within thirty or forty seconds, whether inhaled, subcutaneously injected, or swallowed, it flushes the face and increases the heat and perspiration of the head, face, and neck. Sometimes the increased warmth and perspiration affect the whole surface; in other cases, while the rest of the surface glows, the hands and feet may become very cold, and this condition of the extremities may last many hours. It accelerates the pulse in a very variable degree, sometimes doubling its pace, and this augmented pulse-beat precedes the flushing by a few seconds. It causes the heart and carotids to beat strongly, and the head to feel full and distended, as if it would burst, or "as if the whole blood were rushing to the head"; sometimes it produces slight breathlessness and cough. It often causes slight giddiness, mental confusion, and a dream-like state. When given to animals in deadly dose, the breathing becomes quick, there is great weakness, loss of reflex irritability, and death from arrest of respiration; till the end sensation and consciousness remain unaffected.

The acceleration of the heart is probably due in part to the lowered arterial tension, and in part to depression of the vagus restraint.

The most characteristic effect of this drug is its influence on the vascular system. It relaxes the whole arterial system, greatly reducing arterial pressure. The reduction of arterial pressure is due mainly to the great dilatation of the arterioles, but, after large doses, to depression of the heart also. How does it dilate the arterioles? It has been found that it will dilate the arterioles even after section of the cord just below the medulla oblongata, and hence it is concluded that it does not act by paralyzing the vaso-motor centre, which formerly was supposed to be situated between the calamus scriptorius and the corpora quadrigemina. It must, therefore, act either on subordinate vaso-motor centres, or on the vaso-motor nerve trunks, or on the muscular coat of the arteries. Some have concluded that it affects the arteries, but Brunton believes that it partially paralyzes the sympathetic ganglia and their motor nerves.

The paralyzing effect on the arterial system is well shown by the sphygmographic tracings, the flushing of the face, and the increase in the size of visible arteries such as the temporal, which artery often becomes notably large, sometimes, indeed, doubled in size, and branches of which previously invisible may become plainly apparent. It is also made manifest by the interesting phenomenon observed by

Talfourd Jones, who while cupping a patient over the loins, and finding that blood would not flow, administered nitrite of amyl by inhalation, upon which the cuts immediately began to bleed freely. After an inhalation, the larger arteries are more slow in recovering their normal size than are the capillaries, a phenomenon I have often observed in the temporal artery, which may remain enlarged for half a minute or longer after the blush has left the face.

Dr. Horatio Wood has shown that the loss of reflex action and of voluntary power occurring after large doses, is due to the depressing action of the drug on the motor tracts of the cord, and, to a slight extent also, on the motor nerves and on the muscles. It appears to have no effect on the sensory tracts of the cord, nor on its co-ordinating centres. It abolishes reflex action, but whether it depresses the reflex function of the cord is uncertain, as it may act simply on the motor part of the cord.

The inhalation or subcutaneous injection of nitrite of amyl produces in rabbits sugar in the urine, together with a considerable increase in the quantity of urine. It has been experimentally shown that diabetes can be produced by dividing the sympathetic nerves of the liver, and thereby causing dilatation of the hepatic vessels, with increased afflux of blood to the liver, and it is probable that nitrite of amyl acts in a similar manner by its influence upon the vaso-motor nerves of the hepatic vessels.

Dr. Horatio Wood finds that nitrite of amyl lowers the temperature by checking oxidation. He finds, also, that the inhalation of nitrite of amyl changes both arterial and venous blood to a chocolate colour, due, as Dr. Arthur Gamgee has shown, to the formation of methæmoglobin, by which means the ozonizing property of the blood, and hence the oxidation of the tissues, are lessened.

R. Pick, from observations upon himself and others, finds that after inhaling amyl, if the eye is fixed on a spot on a blank wall, the spot itself, with the surrounding surface, appears of a yellowish hue, the yellow circle being itself surrounded by a violet blue halo, with undulating lines at the edge.

Dr. Brunton first employed nitrite of amyl with signal success in angina pectoris, and found it more effective than any other remedy he had tried in this painful and dangerous disease. During an attack, his patient suffered from throbbing of the heart and carotids as high as the ears, with severe precordial pain extending to the right arm, though the usual characteristic "sense of impending death" was absent. The pulse was slightly quickened, and the sphygmographic tracing modified, for, as Dr. Brunton states, "as the pain increased, the curve became lower, both the ascent and descent more gradual, and dicrotism disappeared. This form of curve clearly indicates that the arterial tension is much increased, and can, I think, be due only to contraction of the small systemic vessels."

The increased tension first led Dr. Brunton to employ nitrite of amyl. In the case in question he attributed the attack to spasmodic contraction of some, if not all, the small systemic and pulmonary vessels, a state of arterial tension which gave way to the nitrite, upon which the pain disappeared. In recurring attacks, the patient inhaled the nitrite of amyl, and always obtained instantaneous relief.

It is now very largely used in angina and with considerable success; indeed, in the majority of cases, no other remedy, except nitro-glycerine and nitrite of sodium, affords so much relief. As might be expected, it is not uniformly successful. I have never known it fail to give some relief, though sometimes this has been very transient, the pain returning as soon as the physiological effect of the drug has passed away. Thus, in one case, due, as we discovered after death, to aneurism of the heart immediately below the aortic valve, an inhalation always arrested the pain, but after a few seconds or minutes it returned (even though the administration was several times repeated) as severely and persistently as if no amyl had been used. In another case, whilst it always arrested the paroxysm, it took ten minutes to give relief, and seemed in no way superior to a full dose of ether, which the patient preferred, because the amyl produced so much giddiness and sensation of fulness in the head. In other cases, however, it has proved strikingly successful. In one desperate case, the slightest exertion brought on intense pain, but armed with amyl, the patient could always at once cut short the attack, and now[1] he can walk several miles, though during his journey he may be obliged to employ the amyl several times. It has appeared to me, that by summarily checking the paroxysm, the attacks come on less frequently and severely, and that, after a time, they require a much smaller quantity to control the pain; so that amyl really contributes to the prolonged relief of these unhappy patients. In some cases, the nitrite of amyl either losing its effects or, the severity of the attack increasing, the drug has to be taken in increasing quantities and at shorter intervals. Two of my patients kept the bottle nearly always in their hands, sniffing the drug every few minutes, and one has used an ounce every week for over a year.

Dr. Talfourd Jones found the nitrite remarkably successful in very severe attacks of asthma, the dyspnœa being immediately removed and its return averted; others, too, have found it very useful in asthma. In my hands it has not proved successful, for although it always arrests the paroxysm for the time being, yet upon the cessation of the physiological effect, the dyspnœa has returned. Talfourd Jones found it beneficial also in a case of cardiac dyspnœa accompanied by extreme anasarca, due to a dilated and hypertrophied heart.

Dr. Talfourd Jones advises the inhalation of the nitrite in syncope, and the drug is also recommended in chloroform poisoning to combat the heart failure; it will at the same time be a respiratory stimulant. Dr. Jones thinks it should be of service in the paroxysms of whooping-cough. It is useful in neuralgia, at least in neuralgia affecting the fifth nerve, often easing the pain at once, and a single administration sometimes averting further attacks; but so signal a result as this is probably very exceptional. Richardson finds that nitrite of amyl arrests, in frogs, the convulsions due to strychnine, and in this way death has been prevented: hence in strychnine poisoning and in tetanus he advises a trial of the nitrite, either by inhalation or subcutaneous injection.

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[1] 1888.

It is better to administer the amyl by inhalation, for, according to Brunton, it will not answer with anything like the same certainty when given by the stomach; thus, in the striking case of angina pectoris just cited, he gave ten minims in brandy by the stomach, with the effect of staying the pain for a short time only, whilst a single inhalation afforded perfect and permanent relief. It should be borne in mind that the nitrite affects some persons much more than others, one individual being able to inhale five or ten drops from a handkerchief, or to breathe the fumes from the bottle held close to the nose, while a whiff from the bottle held at a distance will affect another with great giddiness, much mental confusion, and general weakness. Patients become habituated to it, so that after awhile it must be inhaled several times before it affords relief. This habituation is well exemplified also in the internal administration of the remedy.

By exposure amyl nitrite gets "flat," and loses its efficacy.

Nitrite of amyl is generally considered a powerful and even dangerous remedy, requiring to be watched with great care, and to be given in well-defined quantity. I am sure it is not nearly so dangerous as is generally imagined, though it is true that nervous and sensitive women are often powerfully affected by it. No doubt its administration should at first be conducted by a doctor, in order to ascertain how far the patient is susceptible to its influence, and that the patient may be taught when he ought to discontinue the inhalation; but after one or two trials, the patients will soon learn how to administer it to themselves. I have now five patients with angina pectoris, each of whom carries a small bottle of this medicine, and on the first warning of an attack, whether walking or standing, each at once begins to sniff at the bottle. My patients have done this for months, and one for just a year, the last using the inhalation many times daily, so that he consumes two drachms a fortnight with hitherto unfailing relief. The amyl seems to produce no other effect on the system than that of giving relief to the angina.

Dr. Talfourd Jones recommended a trial of the drug in epilepsy. To an epileptic patient, who, in addition to severe and repeated attacks, suffered from much mental confusion, and was haunted many times a day by an indescribable dread and a sensation as of an oncoming fit, although it came on, actually, only once or twice a week, I gave three drops thrice daily, and an additional dose on the earliest warnings of a fit, with the result of diminishing considerably the frequency of the attacks, and entirely removing the harassing sensations. Sir Crichton Browne has published some observations on the inhalation of nitrite of amyl in this disease. In two rabbits made artificially epileptic, he prevented the oncoming of the convulsions which otherwise follow the application of electrodes to the brain, by making them inhale nitrite of amyl. He likewise has arrested epileptic attacks in man, administering the drug on the occurrence of the aura but before the actual onset of the fit, and he has even cut short the fit after its commencement. By the same means he has rescued several patients from that desperate plight, called the status epilepticus—a condition consisting, essentially, of a succession of fits, linked together by intervening unconsciousness, the fits recurring with increasing frequency, till at last, no sooner is one fit ended, nay, before it has finished, another fit begins.

Amongst other successful cases, Dr. Weir Mitchell reports one where the inhalation was used immediately the aura was perceived, and other instances also of success where the spasms lasted for hours, one fit following another. I have given this remedy with considerable success to epileptic out-patients, in whom the attacks were very frequent. In some it has appeared to be more useful than full doses (20 to 30 gr.) of bromide of potassium thrice daily; in one case, whilst it decidedly lessened the frequency of the attacks, it was less serviceable than bromide of potassium. I have given it in two to five-minim dose, suspended in mucilage, every three hours, or three times a day, without inducing any unpleasant effects, in some cases not even causing flushing, whilst in other cases the patients have flushed with each dose, but only whilst swallowing it.

Dr. Maraghano uses it successfully in epilepsy. He raises the dose to forty drops even, and says the inhalation may be prolonged forty minutes, and be repeated four or six times a day. He gives it at fixed times of the day, and not just before or at the onset of an attack. In twenty-four hours 1 to 2·5 grammes of sugar appear in the urine.

The patient should take the medicine whilst lying down, and as some patients, especially women, are very readily affected by the drug, it is well in the first instance to give it in smaller dose than that above mentioned; but until the remedy is pushed to two and in some cases to five minims every three hours, I have failed to obtain conspicuous results. Sir Crichton Browne maintains that epileptics are more sensitive than others to inhalations of amyl. I imagine that this medicine will only be found useful in frequent attacks, and that *it will* not be of avail when the fits occur at comparatively long intervals, such as three weeks or a month.

Inhalation of nitrite of amyl has been recommended in sick headache in that form which is due to spasm of the blood-vessels of the side of the face, and is indicated therefore when the skin of the affected side of the face is pale. However, in most cases, these guiding symptoms fail altogether, for it is quite the exception for the skin of the affected side of the face to be in any way altered in colour, either blanched or flushed, neither is it common for the pupils to be unequal. And yet, without any vascular or ocular change being present, inhalation of amyl nitrite will sometimes do good. Inhaled at the beginning of an ague fit, amyl may prevent or remove the shivering.

Nitrite of amyl is useful in sea-sickness, and it proved very useful in the following singular case, allied no doubt to sea-sickness:—A young woman could not travel either by coach or train without suffering great sickness and headache leading to considerable exhaustion, these symptoms persisting for many hours after the completion of the journey. Half a minim of nitrite of amyl dissolved in twenty minims of spirits, and a drachm of water, taken hourly, prevented these symptoms almost entirely.

I have used this remedy extensively with considerable success in cases of the following kind:—A woman, perhaps from the sudden arrest of menstruation, or through depraved health, or nervous depression, or more frequently at the change of life, suffers from frequent attacks of flushings or "heats" starting from various parts, as the face, epigastrium, etc., and thence spreading over the greater part of the body. The face, and even the back of the hands, will often be deeply reddened, and the veins of the hands in some cases will dilate to double their previous size. In some cases although the patient may feel deeply flushed the skin remains natural. The sensation of heat may be so urgent that the patient loosens her dress, or removes the greater part of the bed covering, and even throws open the window in the coldest weather. These heats may last a few minutes only, or an hour or more, and may be repeated many times a day. They are generally followed by perspiration, often very profuse, at other times the skin remains dry; the attacks are then commonly termed "dry heats." The "heats" are often accompanied by great throbbing throughout the whole body, followed by much prostration, the patient seeming scarcely able to rouse herself. After the heats pass away the skin sometimes becomes cold and clammy, and may turn very pale. The least exertion or excitement may bring on these heats. Patients subject to these symptoms will generally complain of cold feet, and sometimes of cold hands. The flushings are occasionally peculiarly and abruptly limited, reaching to the thighs, knees, or elbows, and while all the parts above these feel burning hot, the parts below feel icy cold. Sleep is often much broken, the patient waking with frequent starts, and in the morning feeling unrefreshed. Sometimes the heats occur chiefly at night. In many cases palpitation or "flutterings at the heart" will occur on the slightest excitement, or even without apparent cause.

Nitrite of amyl will prevent or greatly lessen these flushings or "heats," and avert the profuse perspiration, throbbing of vessels, and great prostration. Sometimes it warms the feet and hands and controls the fluttering at the heart, but in most cases it fails to abate these last symptoms, and for their cure other remedies, such as iron, are required. Amyl will also remove the giddiness, confusion of mind, and heaviness in the head, and even the headache. It generally produces calm refreshing sleep.

When the flushings and perspirations are slight, this remedy is scarcely needed, and, moreover, the perspirations are generally considered to be vicarious and beneficial at the change of life and, in many cases, form only a minor part of the troubles of which the patient may complain, such as great sinking at the epigastrium, severe pains in different parts of the body, and other sufferings incident to this period, over which nitrite of amyl has little if any influence; but when flushings constitute the chief part of the patient's troubles, this medicine is most serviceable.

In the course of ten days the nitrite of amyl completely cured a woman who for three years had been horribly tormented with singular attacks, repeated several times daily, of a severe burning sensation across the loins, whence a glow of heat would spread over the whole body, to be followed by perspiration. The burning sensation was so unendurable that she was constrained to open the window at night even in the winter, and sometimes to rush out of doors.

For the symptoms just described I have generally administered this drug by the stomach, though the inhalation answers as well. In respect of dose it must be borne in mind that, like glonoine (nitroglycerine), the effects of amyl nitrite vary greatly with different persons, one, two, or even three minims producing in some only flushings of the face and slight giddiness, while in the case of others even a drop will induce various disagreeable symptoms. Thus one woman immediately after a drop dose turned deadly pale, felt giddy, and then became partially unconscious, remaining so for ten minutes. In another patient the same dose produced a sensation as if "a vapour spread from the throat through her head," and rendered her quite powerless for one or two seconds. A third of a minim dose sometimes excites great nausea, or a tickling in the throat; and one delicate woman, after one-thirtieth of a drop, passed for a few minutes after each dose into a trance-like state, everything to her seeming unreal, and the breathing becoming somewhat panting. I began originally with a minim dose, but was obliged to reduce this quantity, and found ultimately that, for the most part, these patients can bear one-*third* of a minim without any disagreeable symptoms, but that a *tenth*, nay, even a thirtieth, of a minim will in some patients suffice to counteract the flushing. The drug may be dissolved in rectified spirit, two minims to the drachm, and of this the dose will be three to five drops on sugar every three hours, with an additional dose as soon as the flush begins. Relief generally ensues immediately, but sometimes not till the medicine has been taken for a week. As the patient grows accustomed to the remedy the dose must be increased. Dr. Mary Jacobi finds the inhalation of amyl nitrite useful in dysmenorrhœa.

In a case where two ounces of laudanum had produced a small and feeble pulse, infrequent respiration and cyanosis, the nitrite of amyl proved very useful, its inhalation immediately improving the symptoms, and the patient ultimately recovering. Dr. Burroughs also reports a case of opium poisoning, where nitro-glycerine proved very useful.

Dr. P. A. Walters shows that nitrite of amyl inhalation influences in no way the urea, uric acid, water, or acidity of the urine.

NITRO-GLYCERINE

NITRO-GLYCERINE is a trinitrite of glycerine. Dr. M. Hay holds that it is decomposed in the blood, and other alkaline fluids, nascent nitrous acid being liberated.

Dr. Murrell, whilst working with nitro-glycerine, was struck by the similarity of its action to that of nitrite of amyl, and he was thus led to anticipate that nitro-glycerine would prove useful in angina pectoris.

Twenty years ago Mr. Field, of Brighton, took, himself, two minims of a one-per-cent. solution. In three minutes he experienced a sensation of fulness on each side of his neck, with nausea, and for a moment or two some mental confusion. He heard loud rushing noises in his head, and felt constriction round the lower part of his neck; his forehead became bedewed with perspiration, and he yawned frequently. These symptoms passed away in about half an hour, but were followed by slight headache, dull heavy pain in the stomach, and a sensation of sickness without vomiting. For some hours he felt languid and disinclined for mental or physical exertion, and the headache lasted till next morning.

Mr. F. A. James, of University College Hospital, also tested the drug on himself, and for a few minutes felt as if intoxicated.

Dr. Murrell made a large number of observations on himself and on others confirmatory of the foregoing statements. After taking one or two minims of a one-per-cent. solution he felt painful pulsation over the whole head, the pulsation soon affected the entire body, and was so severe that it seemed to shake his entire frame, and visibly jerked a pen held in his hand. The pulsation was felt to the finger-tips. He also experienced a sensation of fulness over the whole body. So long as he kept quiet these symptoms were slight, but they greatly increased on movement, and the headache was intensified on stooping. These symptoms lasted about five minutes, and were followed by a dull aching frontal headache, with languor, depression, and inability for work. He did not feel sick, had no mental confusion or giddiness. His sight and hearing were not affected till about half an hour after taking the drug, but he felt drowsy. The headache lasted till next day. For many years I have employed this substance, and from my own experience can confirm all the foregoing statements.

From numerous observations Dr. Murrell found that the symptoms began in about two or three minutes after swallowing the medicine, the acute symptoms lasting about ten minutes, whilst headache and languor persisted for about four to five hours.

Though the drug produces a glow on the face, accompanied by perspiration, still it only very slightly flushes the face, in this respect differing from nitrite of amyl. Sometimes nitro-glycerine causes very free perspiration.

The headache of nitro-glycerine is at first throbbing, and felt over the forehead, sometimes on the top of the head, sometimes at the back. The continuous pain is dull and aching. Nausea is an uncommon symptom.

The drug increases the pulse-rate about twenty beats per minute. The acceleration begins in about five minutes and continues half an hour. The pulse becomes full, bounding, large, and rather soft, but never intermittent or irregular. The pulse, indeed, manifests the characters due to arterial relaxation.

Dr. Murrell has made one hundred and fifty sphygmographic tracings, and has compared the action of this drug on the same person many times with nitrite of amyl, and finds that nitro-glycerine gives a similar tracing to nitrite of amyl. The amplitude of the trace is much increased, the rise and fall is abrupt. The trace displays marked dicrotism. Dr. Murrell therefore concludes that nitroglycerine causes great arterial relaxation.

The effects of nitrite of amyl come on sooner, and last a shorter time, than those of nitro-glycerine. Thus the effects of amyl begin in fifteen seconds, whilst those of nitro-glycerine are delayed for five minutes. This difference is probably due to the great volatility of nitrite of amyl.

Nitro-glycerine, in medicinal doses, does not affect the temperature.

Chemists employed in preparing nitro-glycerine pills on a large scale complain that it causes sleeplessness.

The susceptibility to this drug varies. A dose of one or two minims of the one-per-cent. solution affects most persons, but I have seen even half a minim greatly affect certain patients, and to such an extent that they could not continue the medicine.

Dr. Murrell recommends nitro-glycerine in angina pectoris, and it is certainly equal, if not superior, to nitrite of amyl. In many cases it is certainly superior. I have seen cases where the relief from amyl was very transient, but that from nitro-glycerine much more persistent. In some cases amyl succeeds best, in others nitro-glycerine. Nitro-glycerine is slower in relieving pain, but its effects are often more prolonged. The drugs should be administered differently. Amyl being chiefly useful when given during a paroxysm should be reserved for these occasions, but nitro-glycerine being more continuous in its action may be given at stated intervals, say every two or three hours, with an additional dose upon the onset of a paroxysm. The regular administration greatly lessens the frequency of the attacks. Occasionally, however, nitro-glycerine produces so much headache that patients are obliged to desist from its use. In one case it at first afforded much relief, but afterwards each dose induced a slight paroxysm. It should be given in $\frac{1}{100}$ minim dose, either dissolved in water, or made into tablets, as sold by Martindale. One of my patients took a hundred of these tablets a day, with great benefit.

Dr. Whitla states that much smaller doses, very frequently repeated, will give yet better results in angina; thus he divides the official tablets into small fragments, into about ten parts, and orders the patient to take one of these every half-hour, or he orders tabloids to be made, each containing $\frac{1}{1000}$ minim. "It is thus easy," he says, "to obtain all the benefits we wish from the drug, without producing marked flushing of the face, or throbbing of the vessels of the neck, or headache."

Nitro-glycerine is recommended in sea-sickness.

Dr. Neale has seen it of great service in paroxysms of asthma, and in migraine. Speaking of a case of asthma, he says, "The tongue of the patient was touched with the stopper of a bottle containing a 5 per cent. solution, when the paroxysm was so severe as to cause consternation to all around, and in less than a minute there was a great calm."

It has been long used in migrainous headaches, and in many cases, no doubt, it is very efficacious, though it fails not unfrequently. I give a tablet containing $\frac{1}{100}$ to $\frac{1}{200}$ of a minim every hour or oftener immediately the headache begins. Dr. Hammond gives it in the aparoxysmal period, and successfully, to avert the attacks. Dr. Hammond also gives nitro-glycerine in epilepsy and in the status epilepticus.

It sometimes cures hiccough, and, like nitrite of amyl, it averts the cold stage of ague.

Nitro-glycerine is employed in contracted kidney to lower arterial tension, and it often relieves the distressing headache of Bright's disease better than other remedies. It is said to increase the quantity of urine in chronic parenchymatous nephritis.

Injected into the jugular vein, nitro-glycerine arrests the heart. It paralyzes the vagus (Brunton). Like other nitrites, it affects the blood, which becomes chocolate-coloured. It tetanizes, and then paralyzes frogs, but not through the spinal cord (Brunton). It directly paralyzes muscle. It destroys the reflex functions of the cord, and death takes place from asphyxia.

NITRITE OF SODIUM

WE have just seen how similar is the action of nitro-glycerine to that of nitrite of amyl, and it is probable that this similarity depends upon the nitrous element and that all nitrites act in the same way; thus, Dr. Reichert, Dr. Mitchell, and Dr. Matthew Hay, all find that nitrite of sodium and nitrite of potassium act just like nitro-glycerine and nitrite of amyl. Moreover, in the preparation of nitrous ether, which contains nitrite of ethyl, the workmen suffer from symptoms just like those produced by nitrite of amyl and nitrite of sodium.

Dr. Matthew Hay finds that nitrite of sodium in dose of five, ten, or twenty grains accelerates the pulse, causes throbbing, and a sensation of fulness in the head and eyes, together with slight flushing of the face. The sensations of throbbing and fulness may last an hour or more, the larger the dose the longer these sensations persist.

Gamgee has further shown that nitrite of soda affects the blood like nitrite of amyl.

Nitrite of sodium frequently acts as a purgative on rabbits and dogs, even when injected subcutaneously, and it reddens and inflames the mucous membrane of the bowel.

A large toxic dose causes in man giddiness, blueness of the face and hands, fluttering at the heart, throbbing pains in the head, and sometimes violent perspiration; these symptoms may continue for one or two hours.

The drug is useful in angina pectoris. I find it, however, less useful than nitro-glycerine or nitrite of amyl. This may be due to the rapidity with which it undergoes change, whence but little or none of the nitrite may, in a given case, be administered. Its instability will probably prevent its coming into extensive use.

One grain repeated several times a day is as a rule an efficient dose, but larger doses, two to five grains, may be required, and quite recently in a case of angina at hospital, the disease yielded to this remedy in 2-3 grain dose, though nitro-glycerine had previously given but little relief.

It has been recommended in epilepsy, but further evidence is required to prove that it is useful in the graver forms of this obstinate disease, though I have certainly lessened the frequency of the attacks of *petit mal*, by a grain dose, twice or thrice a day.

Lublinski finds it useful in nervous and bronchial asthma, but useless in the asthma due to emphysema. Fraser also has reported well of it in bronchial asthma. Lublinski finds it very useful in migraine. It is useful in the asthma of Bright's disease. Like nitrite of amyl, it will avert the cold stage of ague.

Nitrite of soda, then, may stand as an alternative drug to which we may have recourse in anginal cases which have resisted either nitrite of amyl or nitro-glycerine or both. In general it will stand, however, rather as an alternative to the latter, for it will scarcely compete with, or be a substitute for, amyl nitrite in the immediate treatment of the paroxysm of angina.

CAMPHOR

THIS substance has close chemical affinities to the volatile oils and turpentines, the consideration of which follows immediately.

At the temperature of the body camphor is solid, but it slowly volatilizes, even at a lower temperature. Little soluble in water, it dissolves freely in oil and alcohol. Camphor destroys most plants, though some of those of the lowest organization, *e.g.* the fungus, commonly called mould, may be unaffected; it hinders the development of bacteria, and is therefore to some extent antiseptic. It is said to be poisonous to fleas, bugs, spiders, moths, and other insects. Camphor, locally applied, excites redness and heat, and indeed it may cause slight inflammation, even through the unbroken skin; of course it irritates more powerfully wounds and delicate structures such as the mucous membranes, and in them may produce not only active inflammation, but even sloughs and ulcers. It has been applied to stimulate indolent sores. In addition to its stimulant powers it possesses sedative or anæsthetic powers; these are manifest after the irritation has passed off, and it is hence a useful addition to dusting powders to allay the heat, tingling, and itching of eczema and intertrigo. Camphor is a common ingredient of tooth-powder, and is used as a corrective of foul breath.

It is largely used as a liniment to relieve pain—neuralgic, myalgic, and rheumatic: also as a stimulant or counter-irritant to sprains and to joints affected by chronic rheumatism.

Camphorated alcohol has been recommended as a remedy for boils in their earliest stages; the remedy should be applied three times a day for half a minute, the skin then allowed to dry, and then camphorated oil smeared over it. It is said that a few applications will usually disperse the coming boil. Inhaled, or taken by the stomach, camphor exerts a decided influence on "cold in the head."

Employed at the beginning of an attack (it is useless after the first stage), camphor sometimes arrests an ordinary cold, and, failing this, it abates its violence, obviating or diminishing frontal headache, and restraining the sneezing and running at the nose.

Camphor inhalations are sometimes useful in that troublesome and chronic complaint characterized by seizures of incessant sneezing and profuse watery running at the eyes and nose, the patient remaining well in the intervals. These attacks may occur daily, beginning early in the morning, and lasting for a few minutes only, or persisting for several hours: they may occur at any hour of the day, and they may recur several times daily. Sometimes several days will intervene between the attacks, which may last twenty-four hours, or even longer. They are generally accompanied by severe frontal headache. In some instances an itching of a point inside the nose will denote the imminence of an attack. This affection often lasts for years.

In catarrh, and in this unnamed affection, the patient should either sniff up finely-powdered camphor, or inhale by the nose some of an alcoholic solution poured upon the handkerchief, or the steam from hot water, into which some of the spirits of camphor have been poured; when boiling water is used, it is needful to protect the eyes from the camphor vapour, to obviate smarting and inflammation in them. At the same time the patient should take internally four to six drops of the alcoholic solution of camphor every fifteen minutes for the first hour, and hourly afterwards.

For drowsiness or headache occurring at the change of life, and due to perverted action of the uterus, Dr. Tilt orders eau de Cologne saturated with camphor to be rubbed into the head. A lotion of equal parts of the solution of ammonia and spirits of camphor, dabbed upon the painful surface, is a useful application in the case of heat and sensation of weight at the top of the head, so frequent at the change of life or as a result of menstrual disturbance. The same lotion is useful in migraine.

Camphor excites in the mouth and stomach a sensation of coldness, followed soon by a sensation of warmth. Large doses excite epigastric pain, nausea, and vomiting. After death from poisonous doses the stomach and intestines are found reddened, and sometimes even ulcerated, the amount of mischief depending on the form of administration of the camphor, which, if swallowed in solution, passes quickly into the blood, the stomach being but little affected, but which, if swallowed in the solid form, owing to the high melting-point, remains long enough in contact with the mucous membrane of the stomach to excite severe inflammation; most of the camphor thus exhibited escapes undissolved in the motions.

Dr. Bartholow recommends five to fifteen minims of the spirits of camphor for flatulence, and especially for hysterical flatulence, also for flatulent colic occurring at the change of life.

Few, if any, remedies are comparable to camphor in summer diarrhœa and cholera. Its benign influence in cholera is most conspicuous, for it generally checks the vomiting and diarrhœa immediately, prevents cramp, and restores warmth to the extremities. It must be given at the very commencement, and repeated frequently, otherwise it is useless. Four to six drops of the stronger spirits of camphor must be given every ten minutes till the symptoms abate, and then hourly. It is a good plan to mix it with a little brandy, but it acts admirably alone.

Dr. George Bird employs spirit of camphor with good results in the acute diarrhœa of infants, and where admissible gives it in milk. Camphor generally restrains the diarrhœa excited by the effluvia of drains. Some persons, especially women, on exposure to cold, suffer from diarrhœa, accompanied by severe cutting pains: standing on cold objects is especially likely to excite this form of diarrhœa. The pain just referred to may at times be very severe, and continue till the bowels have acted three or four times; camphor generally relieves this pain, and restrains the diarrhœa.

Camphor passes readily into the blood, and manifests itself there, and in most of the organs of the body, by its odour. Its influence on the blood is unknown. Its influence on the heart appears to be capricious. Large doses often slacken, sometimes quicken, and generally weaken, the pulse. Moderate doses, it is said, quicken and strengthen the pulse, and in cases where this organ is paralyzed by irritation of its inhibiting apparatus, camphor may in part remove the arrest (Binz). The respiration is also stimulated by moderate doses. Large doses sometimes disturb the brain, causing at first increased activity, with a rapid flow of pleasant ideas, but subsequently, and in some cases even from the first, great faintness, giddiness, noises in the ears, much delirium, passing sometimes, like alcoholic intoxication, into drowsiness, and even convulsions, with coldness of the surface, shrunken features, and clamminess of the skin. The drug causes some depression of temperature, though this is not noticeable for small doses. Large doses often induce some smarting and pain of the urinary organs, with urgent desire to pass water.

Camphor is mainly given in adynamic fevers, and, according to Graves and others, it is a very valuable remedy. It is said, in these states, to strengthen, while reducing the frequency of the pulse, to moisten the skin, and check the delirium, especially when this is of a low and muttering character. To control delirium, it must be given to the extent of twenty grains, or more, every two or three hours, and its effects must be watched. Some practical authorities, however, deny the efficacy of camphor in fever delirium.

Abroad, especially in Germany, camphor is much used as a cardiac stimulant in all cases of threatened failure at the heart or lungs (Binz). If an immediate effect is desired, Binz states that the hypodermic injection of an oily solution, at the temperature of the body, is alone to be trusted in. This injection may be repeated more or less often according to results. Thus a solution, 1 in 5, in almond oil may be employed. This is not painful nor does it give rise to abscess locally, and absorption occurs rapidly. Dr. G. Schilling employs the usual solution of camphor in olive oil, 1 in 10, and of this he injects as much as ten grammes (= 15 grains of camphor) for a single dose. Most would be afraid of such a dose, but Schilling strongly advises it in cases of collapse. (*Therapeutische Monatshefte*, Nov., 1895.)

It has also been recommended in melancholia.

In spasmodic affections, in nervous palpitation, and in hiccough, camphor is employed. Part of its action in troubles of this kind will, doubtless, be local.

It is reported, on high authority, that considerable doses of camphor will control inordinate sexual desire. Drachm doses of the spirit will relieve chordee. It is said to relieve strangury.

Camphor may be given dissolved in milk, of which one ounce will dissolve as much as one drachm. Ten grains, frequently repeated, may be given by the mouth in collapse (Whitla). Binz puts the usual dose of camphor at three-quarters to three grains every two hours, either in powder (triturate) or in emulsion. The triturate may be given in wafer paper. The emulsion is made by taking one part of camphor, of gum arabic q. s., and of water one hundred and fifty parts.

Camphor is eliminated in the breath, probably in the perspiration, and in small proportion in the urine. The irritation it produces in the urinary mucous membrane, in spite of the small amount of camphor separated by the urine, has led to the assumption that some products of its decomposition in the body escape with that secretion, and, in their passage, irritate the mucous membrane; but on this point nothing definite is known, and at present there is no proof that camphor is consumed in the body.

MENTHOL (PEPPERMINT-CAMPHOR)

THIS substance is, like camphor, a stearoptene, *i.e.* a solid oxygenated substance, obtained from and closely allied to a volatile oil. It is possessed of decided antiseptic powers and in addition is a valuable local anæsthetic; it is readily soluble in rectified spirits, 5 in 1, in ether, chloroform, and in both fixed and volatile oils; it is insoluble in glycerine, and very slightly soluble in water. Applied locally to the skin, or in dilution to a mucous membrane, it first stimulates or irritates the part, and then gives rise to a great sense of coldness. Applied in the neighbourhood of the eyes, the vapour given off excites a free flow of tears.

It is extensively employed, in the form of liniment or pigment, in the treatment of neuralgias and superficial pains generally. It may be applied in the solid form, *e.g.*, the stick or pencil, and simply rubbed on gently; more commonly it is applied in the liquid form in combination with other bodies, *e.g.*, as menthol-camphor, a liquid obtained by rubbing together equal parts of menthol and camphor; as menthol-thymol, a liquid obtained in a similar manner from menthol and thymol; or again as menthol-chloral, also a liquid, obtained by rubbing together equal parts of menthol and chloral hydrate. Other combinations are made with butyl chloral hydrate and with carbolic acid. (*See* Martindale's ***Extra Pharmacopœia.***) Or, again, menthol may be dissolved in chloroform and liniment of aconite; one such anodyne application, much prescribed by the late Sir Andrew Clark, consisted of menthol four drachms, chloroform four drachms, liniment of aconite six drachms, and liniment of camphor two drachms; of this liniment a half of a small teaspoonful was ordered to be rubbed in gently, or smeared over the affected part after first washing it with hot soap and water. Should the pain resist this application, the same quantity of the liniment sprinkled on warm flannel was to be applied and worn. Over delicate parts of the skin, *e.g.* the face, this liniment should be painted lightly with a camel-hair brush, with care as to proximity to the eyes. In muscular rheumatism and in chronic rheumatic pains in fasciæ or joints, this is a valuable application. The menthol-chloral or the butyl-chloral and phenol combinations applied on cotton-wool to carious teeth are very useful in toothache.

Menthol in the form of the official plaster is often useful in rheumatic pains, muscular or other.

In pruritus, menthol gives excellent results, either in spirituous solution, half a drachm in one and a half ounces of spirits of wine, to be painted on over the affected part, or as an ointment, composed of two drachms of menthol rubbed up with half an ounce of olive oil and one drachm of chloroform, and incorporated in two and a half ounces of lanoline (Whitla). A menthol soap (superfatted) of five per cent. strength, as prepared by Eichhoff, may be used with good effect, locally or generally, the affected part being well lathered with the soap. In severer forms of pruritus the lather may be allowed to dry on, or it may be kept moist by means of water-tight dressings.

Five to fifteen grains of menthol to an ounce of simple ointment is very useful in pruritus ani et pudendi, and to a less extent in the itching of eczema. The stronger preparations may produce much smarting, therefore the weaker should be first tried. This ointment is often successful when calomel ointment fails.

Menthol is used also as a pigment to the throat, or as an intralaryngeal injection in the painful or irritable throat of tubercle of the larynx. A twenty per cent. solution in olive oil is best employed;

sometimes a ten per cent. will be more suitable. The Throat Hospital orders a fifteen per cent. solution in white adepsine oil as a pigment, or half this strength as a spray.

In nasal irritation, and in attacks of sneezing, at the onset of coryza, menthol is often used as an inhalation on the dry inhaler.

A piece of cotton-wool saturated with a ten per cent. solution of menthol inserted into each nostril at the beginning of an attack of coryza, directly itching and sneezing begin, and allowed to remain for four or five hours, is said to cure a cold in the head.

There are numerous formulæ for menthol snuffs, varying in strength from one per cent. (five grains to the ounce, *Throat Hospital Pharmacopœia*, up to one in twenty or one in ten), the vehicle should be some simple powder, *e.g.* the oxychloride of bismuth or starch, or powdered talc, etc. Menthol may be combined with boric acid, chloride of ammonium, etc.

Menthol, as stated, has antiseptic powers, and it is probably in virtue of this action that Dr. Selwyn Russell finds that cutaneous inflammations, such as boils, carbuncles, excessive inflammation following vaccination, are speedily relieved by painting the inflamed tissue several times a day with a ten to fifty per cent. solution of menthol in ether or alcohol.

Taken internally, menthol has a very marked sedative effect upon the stomach, and it is for this reason highly recommended in some forms of vomiting, especially in the continued vomiting of pregnancy; three-fourths of a drop in spirituous solution, freely diluted with water, is the dose, which should be repeated hourly.

THYMOL

This, another stearoptene, is obtained from oil of thyme, and is closely related to carbolic acid in its composition. Like carbolic acid it is antiseptic, and has been much used for this action, especially on account of its agreeable odour. Volckmann's solution consists of one part of thymol dissolved in alcohol and glycerine, of each twenty parts; to this water is added up to 1,000 parts. This solution may be used as a spray or as a lotion.

Apart from the undoubted virtue of its fragrance, it is a question whether thymol can claim any special consideration. In the treatment of offensive perspirations, especially about the feet, it may be added to the oleate of zinc, which is used as a dusting powder.

It has been used internally as an antiseptic, in one-half to two-grain dose, or more, in pill or in solution, spirituous, oily, or watery. It is very insoluble in water, one in 1,100 parts.

TURPENTINE. OIL OF TURPENTINE

To this, as one of the most important of the volatile oils, belongs a special place.

Turpentine is antiseptic. Applied to the skin it excites a sensation of warmth, with some redness, and, if the application is sustained, blistering takes place. It is in common use as a rubefacient and counter-irritant, and may be thus prescribed:—Over a flannel wrung out of hot water some turpentine or turpentine liniment is sprinkled, and the flannel then applied till it produces redness, tingling, and smarting. It is well to bear in mind that, as the smarting arising from the application of a turpentine stupe goes on augmenting for some time after its removal, it should be kept on no longer than just sufficient to excite a moderate degree of pain. Turpentine stupes may be employed as rubefacients for the same purposes as mustard poultices.

Turpentine is often employed in the form of liniment, and is useful in myalgia, superficial neuralgia, and lumbago. Turpentine liniment, or an ointment containing turpentine, is useful in unbroken chilblains.

Dr. Faulis employs the following method in ringworm:—He cuts off the hair and rubs the patch with turpentine till it smarts. He then washes it well with carbolic soap (10 per cent.). The smarting soon ceases. After well drying the skin, he paints on it two or three coats of tincture of iodine. Lastly, he anoints the hair with carbolic oil (1 in 20). He claims to cure the worst cases in a week.

Turpentine in the stomach excites a sensation of warmth, and large doses may produce nausea and vomiting. It generally, but not invariably, acts as a purgative, and if, after large doses, purgation does not take place, serious symptoms will sometimes arise, due to the absorption of the turpentine, and its action on organs at a distance from the intestinal canal. Therefore, when administered in considerable dose, it is desirable to give, either simultaneously or soon afterwards, some more active and certain purgative, such as castor-oil. Even after large doses, the stomach and intestines of animals have sometimes been found free from inflammation.

In staying hæmorrhage from the stomach, arising from chronic ulcer, or other causes, also from the intestines in typhoid, etc., few remedies are more successful than turpentine given in small doses, five to ten drops, very frequently repeated. Later on we shall speak of the use of turpentine in controlling hæmorrhages from other, distant, organs.

Turpentine proves useful in certain states of typhoid fever, probably from its direct action on the intestinal mucous coat. Thus Dr. Wood has drawn attention to its value in ten-minim dose, repeated every two hours, when the tongue parts with its fur in flakes, and instead of becoming and remaining moist, looks dry and glazed, a condition usually observed towards the end of the disease, and accompanied always by an increase of the tympanites, and an aggravation of the other symptoms. In "the course of twenty-four, or at most forty-eight hours, some amelioration of the symptoms may be observed. The tongue becomes gradually moister, and covers itself with a whitish fur; the tympanitic distension ceases to augment, and after a time diminishes; the pulse becomes less frequent and the skin less dry and harsh, and the patient enters slowly but regularly into convalescence, often without any other remedy. As the case improves, the quantity of the turpentine should be diminished, but care should be taken not to omit it too hastily." Dr. Wood further says, "I will repeat that oil of turpentine may be used, with great hope of benefit, in any case of enteric fever in the advanced stage, with a dry tongue." [1]

Dr. Graves employed it in the same disease in drachm doses every six hours in extreme tympanites, and he pointed out that the remedy is of no use if, before and during the production of flatulent distension, there is diarrhœa; when this last is the case, acetate of lead is invaluable. With the tympanites there is very often much prostration, with muscular trembling, and picking of the bed-clothes, and low muttering delirium—symptoms all of which, according to Graves, are benefited, in many cases, by the use of turpentine.

This drug is successful as a tape-worm poison, though it has now given place to milder and more efficient remedies. Large doses of half an ounce to an ounce must be given, and should be combined with a purgative, *e.g.* one ounce of castor oil, for if absorbed, this quantity may produce disagreeable symptoms. A smaller dose of a drachm is sometimes ordered three times a day, but the fuller dosage is best.

Turpentine injected into the rectum will destroy thread-worms, but many other substances are just as effective vermicides.

Turpentine enemata are useful in flatulent distension of the bowels. One egg to each ounce of turpentine will be found useful to incorporate it in the enema of barley mucilage or thin gruel.

Turpentine may be inhaled with benefit in chronic bronchitis, but terebene is pleasanter and preferable.

Turpentine passes readily into the blood, and may be detected in the breath and sweat, and in an altered state in the urine, giving to this excretion an odour of violets or of mignonette. It escapes chiefly by the kidneys.

Administered by the mouth in large quantities, and especially if it fail to purge, and thus to escape promptly by the rectum, turpentine is absorbed and produces in most persons some excitement, with giddiness, confusion of sight, quickened pulse, and, in extreme cases, insensibility, with dilated pupils. In many instances it produces bloody and scanty urine, and, indeed, it may suppress this secretion; occasionally it excites pain along the urinary tract, with frequent and painful micturition.

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[1] Osler regards the employment of turpentine as a *routine* treatment in typhoid fever as a "useless practice, for the perpetuation of which in this generation H. C. Wood is largely responsible."

Dr. H. A. Hare shows that moderate doses increase the frequency of the heart's beats from direct stimulation, but that larger doses reduce the frequency by stimulation of the vagus centre. He finds, also, that neither large nor small doses have much effect upon the vaso-motor system. In small doses turpentine stimulates the whole of the nervous system, the brain first and most, but large doses depress this system, and lessen reflex action.

As we have said, it is very efficacious in bleeding from the alimentary tract; it is also useful in bleeding from the lungs, nose, uterus, kidneys, and bladder. These effects result probably from absorption. A drachm should be given every three hours, a dose which sometimes, however, causes sickness, diarrhœa, and even blood in the urine; but should this arise, the blood soon disappears on discontinuing the drug.[1] Given to check bleeding from the kidneys, as in Bright's disease, it must be administered in very small quantities, five-drop doses. It is reputed to possess the power of checking bleeding in the hæmorrhagic diathesis, and to be useful in purpura.

Large doses of this medicine are given in puerperal fever, but authorities are divided as to its usefulness.

According to some authorities it has been employed with great success in sciatica, in half-ounce doses, given for four or eight successive nights, when, if it fail to give relief, it may be pronounced useless in that particular case.

Dr. George Bird finds that in 20-drop doses, thrice daily, it is markedly serviceable in lumbago.

Spirits of turpentine, in half-drachm doses, several times daily, is very useful in non-specific choroiditis.

It is useful in chronic bronchitis with profuse expectoration, but terebene is generally employed. Dr. Murrell finds terebene very useful in winter cough with emphysema.

Turpentine is reputed to be diuretic, and is sometimes administered in small doses with this intent in Bright's disease.

It has been used in chronic cystitis, in gonorrhœa, and in gleet.

Its stimulant action upon the respiratory and urinary tracts is probably explained in part as a local action, the drug being excreted by the respiratory and urinary organs.

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[1] In hæmoptysis the drug may also be inhaled. Douglas Powell recommends in hæmoptysis thirty minims every two hours for two doses, then in half or one-third this dose—the dose to be given in sweetened mucilage.

It has been given with apparent advantage in biliary colic.[1]

Turpentine is recommended in diphtheria; teaspoonful-doses have been given thrice daily to young children.

Turpentine is an antidote to phosphorus, and Dr. Letheby says that at a lucifer-match factory at Stafford the workmen prevent necrosis of the jaw by wearing near their breast a small open vessel containing turpentine.

The experiments of Personne on fifteen dogs support the view of this antidotal action. To five dogs he gave phosphorus alone, and they all died. To five others, an hour or two after the phosphorus, he gave turpentine, and one only died. To five others he gave turpentine immediately after the phosphorus, and only one dog died. These experiments, however, are not so satisfactory as they easily might have been, as he does not appear to have given an identical dose of phosphorus in all his experiments. Personne thinks that phosphorus produces asphyxia by becoming oxidized, and so abstracting oxygen from the blood. Pyrogallic acid absorbs oxygen from the blood, and Personne asserts that it produces the same symptoms and post-mortem appearances in dogs as phosphorus. He thinks that turpentine *prevents* the oxidation of the phosphorus, so that the latter is eliminated unchanged without inflicting injury on the body.

Köhler confirms Personne's statement of the antidotal power of turpentine, but controverts his explanation of its action. He gave to twenty-five animals from 0·006 to 0·09 gramme of phosphorus, and 4·5 grammes of turpentine, 'and on killing the animals the tissues showed no fatty degeneration, or other sign of phosphorus poisoning. Köhler says that a compound of phosphorus and turpentine is formed, which is eliminated through the kidneys, giving to the urine a smell like opodeldoc, and not like that of violets.

Some experimenters deny the antidotal virtues of turpentine. These contradictory statements are now reconciled by the observations of Jonas, who finds that pure turpentine has no effect on phosphorus, whilst French turpentine forms with it a spermaceti-like crystalline mass—turpentine-phosphoric acid—which is said to be harmless and to be eliminated by the kidneys unchanged. Experiments with the different kinds of turpentine as antidotes to phosphorus confirm these conclusions. The French turpentine must be old and resinous to ensure that it shall contain ozone.

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[1] It is administered in the form of Durande's remedy, consisting of a mixture of ether, 3 parts; turpentine, 2 parts: "15 minims of this may be given in capsule three times a day, during the intervals between the attacks, or every four hours while the attack is on" (Whitla).

GROUP CONTAINING :—

NUTMEGS.
CLOVES.
CANELLA BARK.
CINNAMON BARK.
CAJEPUT OIL.
OIL OF ANISE.
FENNEL.
CARAWAY.
CORIANDER.
DILL.
ELDER FLOWERS.
OIL OF LAVENDER.
OIL OF ROSEMARY.
OIL OF SANDAL WOOD.
OIL OF PEPPERMINT.
OIL OF SPEARMINT.
OIL OF RUE.
OIL OF LEMONS.
CUBEBS.
BUCHU LEAVES.
BALSAM OF TOLU.
BALSAM OF PERU.
COPAIBA.
MEZEREON.
SASSAFRAS.
STORAX.
JUNIPER.
APIOL.
TEREBENE.
BENZOIN, ETC.

THIS group consists of volatile oils, or substances containing volatile oils. Some of the members contain in addition a bitter constituent and are tonic. Most of the volatile oils are antiseptic, some powerfully so.

The ethereal oils penetrate the cuticle, and excite slight inflammation. Some are applied as rubefacients to rheumatic and gouty joints, to the face as counter-irritants in toothache, etc. In these and other cases the essential oils seem to exert not merely a counter-irritation, but to act also as local anæsthetics. Dr. Alfred Wright, of Finchley, says that in China he learned from the natives the practice of painting oil of peppermint on the face in facial neuralgia. He uses it also for the pain of gout, the relief which it gives in both instances being often almost instantaneous. There is a German quack anti-neuralgic liniment which consists chiefly of oil of peppermint.

Balsam of Peru is a useful adjunct to ointment in broken chilblains. Dr. Robertson, of Cheltenham, recommends strongly the local application of cajeput oil in chilblains, stating that sometimes one application will effect a cure. (*See* Iodine.)

All the essential oils destroy lice, whether situated on the head, trunk, or pubes; but in "louse disease" oil of rosemary and powdered pyrethrum are generally preferred.

Many excellent authorities extol storax and Peruvian balsam in itch, and the following preparations are very useful:—Storax, an ounce; olive oil, two drachms. Or, rectified spirit, two drachms; storax, an ounce; olive oil, a drachm; mix the first two ingredients, and add the olive oil to them. The whole body, except the head, is to be carefully rubbed with either preparation. One application, it is said, kills the insects; but, to avoid the risk of failure, it is better to repeat the application in twelve or twenty-four hours. These applications cause no irritation of the skin, and they possess the additional advantage of an agreeable odour. Although not necessary to the success of this treatment, yet for the sake of cleanliness, a warm bath should be given before and after the inunctions.

Dr. McCall Anderson recommends storax highly, asserting that it is as efficacious as sulphur, while, unlike sulphur, instead of irritating it soothes the skin. His formula is :—Storax, one ounce ; lard, two ounces; melt and strain (Shoemaker).

The compound tincture of benzoin painted on the skin, or mixed with water, will sometimes allay the itching of urticaria, eczema, etc.

Benzoic acid dissolved in spirits of eau de Cologne is also very useful in urticaria.

The compound tincture of benzoin in the proportion of one teaspoonful to a pint of water at 140° Fah. gives a most sedative inhalation in congestion and irritation of the pharynx and larynx. Benzoic acid also in the proportion of a drachm added to a pint of hot water, and used as an inhalation night and morning, is often beneficial in bronchitis, and even in chronic phthisis—easing cough and lessening expectoration.

Terebene is a useful inhalant ; in chronic bronchitis five to ten minims should be added to a pint of hot water at 140° Fah., or should be dropped on a handkerchief and placed near or over the mouth.

The members of this group have a warm, and many of them an agreeable taste. Oil of peppermint, orange flower water, oil of cinnamon, oil of lemons, are much used to conceal the flavour of disagreeable medicines.

In the stomach these oils excite a sensation of warmth, and some of them are used to increase appetite and digestion. In large doses they excite slight inflammation of the stomach and intestines. Many of them, as oil of cloves, oil of cinnamon, oil of anise, oil of fennel, oil of coriander, oil of caraway, oil of peppermint, are employed to prevent the griping pains of purgative medicines. It will be remembered that these oils possess anæsthetic powers.

Some, *e.g.* cloves and cinnamon, are useful in diarrhœa as adjuncts to astringents. Their stimulant action on the muscular coat of the stomach and intestines overcomes colic and causes the expulsion of wind ; oil of cajeput (especially) and oil of cloves are generally preferred in flatulence. Spirits of horseradish, in half-drachm or drachm doses, are also highly approved in flatulence. The term carminative is applied to these drugs because of their power to assuage pain (colicky), and dispel flatulence.

It is probable that these oils pass readily into the blood, and for the most part act like turpentine, but whether they undergo any changes in the blood is at present unknown.

After absorption, certainly in large dose, they exert sedative powers upon the nervous system. This power has been made use of in the group of hysterical affections in which an ill-controlled nervous system manifests itself at times in disorderly movements, or even convulsive seizures.[1] The influence of the volatile oils in combating the cramps or spasms of the alimentary tract present in colic, from whatever cause, is another instance of their sedative action, though in this case the action is probably direct upon the bowel. This group is hence, on both counts, spoken of as antispasmodic.

Lavender, rosemary, rue, cinnamon, and some other members of this group are given as stimulants to nervous and hysterical persons affected with depression of spirits and other symptoms; but they soon lose their effect, unless given in increased doses.

These oils, and the resins derived from them, escape from the body, in part by the breath and perspiration, but chiefly by the urine, and in their passage along the urinary tract they stimulate or irritate its mucous membrane. Copaiba will sometimes cause bloody urine with strangury and pain in the bladder.

I know of no remedy so useful in chronic cystitis as pareira. Two to three drachms of the liquid extract every three or four hours speedily reduces the amount of blood in the urine, and more slowly reduces the pus and mucus. At the same time it often promotes appetite. (*See* Pareira.)

Copaiba, cubebs, and especially buchu, are commonly used in chronic inflammation of the bladder and urethra.

Copaiba and cubebs are used in gonorrhœa and gleet; cubebs often succeeds when copaiba fails. Copaiba benefits, it is said, the chronic, but aggravates the acute, stages of gonorrhœa; while cubebs, which must be given in large dose, is considered to be only useful at the commencement of an attack. Copaiba, however, often relieves promptly an acute attack. Emulsified copaiba has been used, especially in the case of women, as an injection for gonorrhœa.

Oil of sandal-wood, in doses of fifteen minims, three times a day, is useful in acute and chronic gonorrhœa.

Balsam of copaiba, in ten to fifteen minim dose, acts sometimes as a powerful diuretic, and Dr. Wilks, who uses it with much success, finds that the diuretic properties reside in the resin. Copaiba has been found very useful in some cases of ascites, removing entirely the abdominal dropsy, and in the dropsy of Bright's disease I have in many cases used the resin in ten to fifteen grain dose, often with great effect. I have seen it answer in cardiac dropsy and in cases of ascites, where the kidneys were healthy, as well as in ascites where there was fatty degeneration of the kidneys, and again in Bright's disease, where the kidneys seemed to be the seat of fibroid change and of fatty degeneration, being as a whole much contracted, granular, red, and firm, the much contracted cortex showing at the same time numerous small opaque buff-coloured spots. I have seen it remove, speedily and entirely, an extensive dropsy, due probably to pale fatty kidney, and I have also known the resin benefit the chronic disease left by an attack of acute Bright's disease; it has likewise prevailed over a case of cardiac dropsy, with a small amount of albumen in the urine, and with signs of general decay. However, in cases which seemed exactly similar I have known it to fail entirely, leading me to think that success or failure depends less on the nature of the disease than on some individual peculiarity. In some cases as stated copaiba causes bloody urine, yet in others I have seen a large amount of blood in the urine disappear quickly under the influence of copaiba resin.

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[1] Valerian, musk, and the fœtid gum resins are more powerful than the group now under consideration.

Many persons esteem juniper highly as a diuretic in scarlatinal dropsy.

Upon the respiratory tract, whence these drugs, in part, escape, they also act, and thus the tincture of cubebs in half-drachm or drachm dose, in half a tumbler of linseed tea, thrice daily, is very useful in coughs due to chronic catarrh, or in those following upon influenza, or again in simple acute catarrh, and in the cough of emphysematous patients. It often indeed cures cough "like a charm."

In chronic bronchitis, and especially in the profuse secretion of bronchorrhœa, Dr. George Bird speaks very highly of cubebs in half-drachm dose, made into a stiff electuary with copaiba balsam; the bolus to be swallowed in wafer paper three or four times daily.

Balsam of Tolu and balsam of Peru, and copaiba, are given in chronic bronchitis with a copious secretion of muco-pus.

Cajeput oil is said to relieve the pain of dysmenorrhœa; one drop may be given on sugar every hour or two till twelve drops have been taken (Whitla). Apiol (derived from parsley) may be given, in capsules containing 3 minims, every two hours for six or eight doses; it is likewise very useful in amenorrhœa given just before the expected period (Whitla). Drachm doses of oil of cinnamon, given several times daily, is strongly recommended in menorrhagia and flooding.

Some members of this group are held to possess alterative powers, and, in particular, mezereon and sassafras are reputed to be useful in syphilis and in chronic rheumatism.

Senator finds benzoic acid, in the dose of 150 to 180 grains daily, useful in acute rheumatism, though inferior to salicylic acid.

Copaiba occasionally produces a rash, sometimes like urticaria, sometimes very closely simulating the papules of measles, but, as a means of distinguishing, there is no fever with copaiba-rash. If the medicine is continued, the papules last many days. The rash does not begin on the face, and then spread downwards over the body, but it is patchy, and shows a preference for the neighbourhood of joints. In doubtful cases, where patients deny that they have taken copaiba, it may be detected in the urine by the smell, and with still greater certainty by chemical re-agents, for, if copaiba is present, nitric makes the urine turbid, which turbidity heat dispels. Copaiba may also be extracted from the urine by shaking it up with ether.

Probably most of these ethereal oils escape from the body in the urine, but, from Weikart's experiments, quoted by Parkes, this does not appear to be the case with copaiba, the volatile oil being, it is stated, destroyed in the body, and only its resinous principle appearing in the urine.

Many of these oils may be prescribed in capsules.

EUCALYPTUS

FROM several species of eucalyptus a volatile oil, the oil of eucalyptus, is obtained. It belongs to the class of volatile oils just described, but deserves, perhaps, separate mention. From the oil of eucalyptus, by fractional distillation, a somewhat purer oil, termed eucalyptol, is prepared.

Eucalyptol destroys the lower forms of life and is a powerful antiseptic and disinfectant. It is more antiseptic than quinine, and this property increases by keeping, whereby it becomes partially oxidized. It arrests the amœboid movements of white corpuscles. When applied to the skin and its evaporation is prevented, it excites redness, and even vesication.

Eucalyptus and its oil possess a warm camphoraceous taste, and they increase the salivary and intestinal secretions, producing copious and soft motions, whilst large doses excite diarrhœa, and the stools smell of the oil. The active principles are readily absorbed.

Eucalyptol excites perspiration.

In large doses it acts on the kidneys like turpentine, copaiba, and cubebs, and, like these drugs, is useful in small doses in acute and chronic nephritis. Eucalyptol is highly praised in chronic inflammation of the bladder, and in chronic catarrh, generally of the genito-urinary tract.

In toxic doses it probably depresses the spinal cord, the brain, medulla oblongata, and heart, and so induces drowsiness, shallow breathing, and lowered arterial tension. It kills by arresting respiration.

The active principles are eliminated by the skin, the bronchial mucous membrane, and the kidneys.

Oil of eucalyptus is employed locally as an antiseptic, and various forms of dressings impregnated with it have been introduced.

A solution in olive oil, 1 in 50, may be employed as an inunction to the body in scarlet fever, in place of carbolic oil, also 1 in 50 (Whitla). This will be of chief value during the desquamative stage.

it is a useful application in chancrous sores and hard chancres; with iodoform and vaseline it is sometimes very useful in the dry stage of eczema.

The same combination may be employed in cancer of the rectum or of the uterus. It is sometimes employed topically in diphtheria, the oil being applied to the throat and also used as an inhalation.

Twenty drops inhaled several times a day from an oro-nasal inhaler will often relieve cough in chronic bronchitis and chronic phthisis. In most cases it is decidedly inferior to creasote, but it sometimes succeeds where creasote fails, and it may be employed when the smell of creasote cannot be tolerated. As a vapour it may be used according to the formula:—Oil of eucalyptus, 20 drops; light carbonate of magnesia, 10 grains; water to one ounce; of this a teaspoonful in a pint of water at 140° Fah. for each inhalation. (*Throat Hospital Pharmacopœia.*)

It is used in the form of medicated cigarettes in asthma, and is highly commended in chronic bronchial catarrh, and in bronchorrhœa to check the secretion.

Preparations of eucalyptus are given in atonic dyspepsia, chronic gastric, and intestinal catarrh, and in vomiting from sarcinæ. Eucalyptol is used as an injection for thread-worms. It is given in the various symptoms connected with the change of life, as flatulence, palpitation, flushings.

It is said to contract the spleen, and to be useful in intermittent fever, but in most cases it is undoubtedly much inferior to quinine.

VALERIAN. VALERIANATE OF ZINC. VALERIANATE OF QUININE. VALERIANATE OF AMMONIA

LIKE turpentine and the volatile oils, valerian produces a sensation of warmth in the stomach, a quickened pulse, some mental excitement, and, in large dose, even delirium.

In the root of valerian there is present a volatile oil, and an acid, valerianic acid, of which latter several salts are prescribed, *e.g.* the valerianates of iron, zinc, ammonium, sodium and quinine.

Some prefer valerian or its preparations, especially the tinctures, and ascribe most of the efficacy of the drug to the volatile oil; others prefer the salts of valerianic acid. According to Pierlot, the active principle of valerian is the oil of valerian, which itself "consists of a mixture of valerian camphene, valerian camphor, valerianic acid, resin and water" (H. C. Wood).

Valerianate of zinc is very useful for those numerous, distressing, and changeable symptoms included under the heading, hysteria, which so frequently occur in women at the menopause. Thus it will generally remove "flushings of the face," "hot and cold perspirations," restlessness, nervousness, depression of spirits, sensation of suffocation in the throat, throbbing of the temples, fluttering at the heart, heat and weight on the top of the head. In many instances these symptoms depend on uterine derangements, or on piles, dyspepsia, or constipation; but when they persist after the removal of all discoverable disease, or in cases where no cause for the symptoms can be detected, valerianate of zinc is often very beneficial. Oxide of zinc does good, but is certainly inferior to the valerianate. In many instances, however, valerianate of zinc fails in the very cases in which we should expect it to be useful, our knowledge of the conditions indicating the employment of these medicines being at present not sufficiently precise to enable us to predict the cases in which they will be likely to succeed. It may be given in 3 to 5 grain dose in a silvered or coated pill, but smaller doses of 1 or 2 grains are often effectual.

Should valerianate of zinc fail in any given case, it will be well to adopt Dr. Brunton's suggestion, and give the oxide of zinc along with a preparation of valerian root.

Valerian has been used with occasional advantage in epilepsy, but whether in true epilepsy, or merely in the hysterical form of the disease, does not always appear.

Valerianate of zinc, or valerianate of ammonium, in twenty-grain dose, relieves, sometimes, neuralgia of the face or head. It is recommended in megrim in doses of from two to five grains thrice daily. It is said that valerian preparations will control the paroxysms of whooping-cough, and the involuntary movements of chorea. Large and increasing doses of valerian are stated to be useful in diabetes insipidus.

Neligan considers valerian a powerful anthelmintic, and especially recommends it when the worms excite convulsions.

ASSAFŒTIDA. AMMONIACUM. GALBANUM

THESE substances are sometimes known as the fœtid gum resins; they contain each a volatile oil, to which they probably owe their chief medicinal value.

They act very similarly on the body, but assafœtida, probably because it contains most volatile oil, is the most powerful.

Assafœtida has a warm and disagreeable characteristic taste; it stimulates the stomach and intestines, expels wind, and in large doses often excites nausea and vomiting. It increases the secretion from the mucous membrane of the intestines, and hence acts as a mild purgative. It is probable that the active principles of these drugs do not pass quickly into the blood, for they make the eructations offensive for twenty-four hours, or longer.

They generally quicken, but sometimes retard the pulse.

A full dose of assafœtida induces general exhilaration, and sometimes "various nervous or hysterical phenomena, and a general sense of *malaise*" (Jörg). It often produces headache and giddiness.

Assafœtida is said to increase the bronchial secretion and the perspiration.

It does not affect all persons similarly, for Pidoux took enormous doses without experiencing any inconvenience, except from the offensive smell of the fæces.

Assafœtida is very useful in hysteria, in many cases removing hysterical headache and certain peculiar sensations in the head. It is also useful in hysterical flatulence.

Assafœtida is useful in the flatulence of young children, unconnected with constipation or diarrhœa. A teaspoonful every hour of a mixture containing a drachm of the tincture to half a pint of water is readily taken by children, and is strong enough to speedily relieve distension. When the flatulence is due to constipation or diarrhœa, assafœtida does very little good. The enema assafœtidæ, B.P., is used in flatulent distension of the bowel.

Assafœtida has been recommended in asthma.

All members of this group are useful in chronic bronchitis, with much wheezing and abundant discharge, symptoms commonly met with in elderly people; but in cases such as these, ammoniacum is generally preferred to assafœtida.

We may sum up the actions of this group as:—A stimulant action upon the bowel (carminative), of much the same nature as that which condiments exert; a stimulant action on the respiratory mucous membrane; and a stimulant action on the nervous system generally. The indications accordingly are, atony of alimentary and respiratory tracts, and of the nervous system.

MUSK. CASTOR

THESE medicines, although once highly esteemed by Graves and Cullen, musk especially, are now but seldom used. Their peculiar and characteristic odour is oppressive and sickening, and sometimes causes headache, giddiness, and even faintness; hence musk is ill-adapted for the sick-room. These substances have a bitter taste.

Jörg asserts that musk, in two to five-grain dose, causes weight at the stomach, eructations, dryness of the œsophagus, heaviness of the head, giddiness, headache, followed by sleepiness, faintness, and a sensation of heaviness in the whole body. In very large dose both drugs may cause trembling of the limbs, and even convulsions. It is said that they strengthen and quicken the pulse. Trousseau and Pidoux failed to obtain these symptoms, noticing only headache with giddiness, the pulse being unaffected.

Dr. Graves employed musk in typhus and other fevers, to prevent prostration, and to strengthen a weak and feeble pulse, and, indeed, it is upon the stimulating effects of musk, *observed clinically*, in such adynamic states, that the fame of musk rests. Recourse is often had to it as a last resource.

Trousseau spoke highly of it in the pneumonia of drunkards, a condition marked by great prostration. He prescribed it in divided doses, frequently repeated up to 15 grains *per diem*.

Professor Horatio Wood commends musk highly in delirium tremens and the typhoid state of the acute specific fevers. He gives ten to fifteen grains with ten to twenty drops of laudanum per anum suspended in mucilage; the laudanum is added to secure the retention of the musk. He draws attention to the fact that it soon loses its effect by repetition. The effect of the above dose lasts, he says, for six hours.

There is general consent, that to be of use in these grave crises the drug must be administered with a free hand.

In cardiac dyspnœa, ten drops of tincture of musk given every quarter of an hour, for four or six doses, is recommended to remove the oppression of breathing and to induce good sleep.

These remedies are employed in melancholia, and for many of those anomalous but distressing symptoms grouped under the heading, hysteria. They have been given in chorea, epilepsy, whooping-cough, nervous palpitation, cramps of various parts of the body, and even in tetanus.

According to Whitla, Dr. Champneys finds great value in the tincture of castor in the treatment of dysmenorrhœa. Cases rebellious to the usual drugs have suddenly yielded to this medicine. He orders it in twenty to thirty drop dose, three or four times a day, during the pain; he may or may not combine it with a few drops of tincture of nux vomica.

There are two great drawbacks to the use of musk:—(1), its great cost, and (2), still more important, the frequency with which it is adulterated, and the difficulty, hence, of securing a reliable drug.

Musk and castor belong to the class of tonics, nervine so-called; they present many affinities to valerian, sumbul, and the fœtid gum resins.

MUSTARD (*See* COUNTER-IRRITATION)

In mustard and capsicum we have substances which possess acrid, irritating powers of which use is made in both health and disease. Thus they are employed as condiments in the former state—if, indeed, we may regard as perfect health that condition of body which calls for the use of condiments—and in the latter state, disease, they are made use of abundantly as irritants or counter-irritants. As condiments they come close to the group of the fœtid gum resins, but we shall here consider only their use as irritants. Mustard flour develops, when moistened, an acrid volatile oil.

A mustard poultice is in common household use as a counter-irritant, and an excitant. Much that has been said of blisters applies to mustard poultices. (*See* Counter-Irritation.) As has been elsewhere stated, cantharides need seldom be applied to the extent of much vesication in order to develop its best powers, and, with regard to mustard, this holds yet more strictly, for vesication should be carefully avoided, since the sore so produced is intractable, heals slowly, and pains sharply. Although mustard may be used in all cases where we employ cantharides, short of vesication, still there are differences in action. A mustard poultice is more painful than a blister; it produces a severe burning, soon becoming unendurable, and if not speedily removed it causes troublesome vesication. A mustard poultice can rarely be borne longer than twenty minutes or half an hour; and if the skin is delicate, as in children and many women, it cannot be endured for so long. Owing to the pain produced, and owing also to its more prompt action, a mustard poultice is more effective than a blister when applied to rouse a drowsy and comatose patient, as, for instance, in poisoning by opium or alcohol, or in certain conditions occurring in the course of fevers. (*See* Counter-Irritation.)

Mustard leaves may be used in place of a mustard poultice. As they often produce rather severe pain, one, two, or three layers of damped muslin may be placed between the leaf and the skin.

When a mustard poultice is employed to affect deep-seated diseased organs, as the lungs in bronchitis, pleurisy, or pneumonia, its action should be sustained for a long time, and should be distributed over a considerable extent of surface; the larger the tract of skin attacked, the greater, indeed, is its influence on the organs beneath. Small mustard poultices may be used to remove a localized pain, but they are in general of much less use. The poultice, therefore, diluted with bread or oatmeal, should be of size sufficient to cover the front or back of the chest, or both, and should be kept on for five, six, or more hours. There is a prevalent idea, perhaps a true one, that the action of cantharides is more searching, and affects the deeper parts more thoroughly.

In bronchitis in children the whole chest should be enveloped in a jacket-poultice, which may be retained in its place by the following contrivance:—The poultice is spread on a piece of linen, sufficiently large for the purpose, to which tapes are tacked; the tapes may be tied over each shoulder, and at three places in front of the chest. The poultice is to be made with tepid water, for boiling water evaporates or interferes with the development of the active princi vinegar destroys the same acrid principle, and alcohol preve formation. On removing the poultice the skin is to be sponged with warm water, or, if the smarting is severe, with ether; the application now of a layer of cotton-wool, although for the first few minutes it may aggravate the pain, soon subdues it altogether.

A general mustard-bath, when appropriately used, often does great good. Although almost exclusively used for children, it is just as serviceable for adults. It may be employed on the recession of the rash of any of the eruptive fevers, to bring back the rash to the skin. In the severe general bronchitis of children, this form of bath is of great service as a counter-irritant. A tablespoonful of mustard should be added to a bath sufficiently large for the child, who should be held in it by the nurse till her arms tingle and smart.

In cases of arrested catamenia a mustard sitz-bath may be used to redden and irritate the skin of the buttocks and thighs for a few days before, and during the time the missing discharge is due. A course of mustard-baths assists considerably the restoration of the uterine functions.

Added to a hot foot-bath, mustard is used to relieve headache, congestion of the head, and inflammations of the internal organs. Applied to the nape of the neck, a mustard poultice, or the more convenient mustard leaf, covered with one, two, or three folds of muslin, according to the susceptibility of the patient to the action of the poultice, is often serviceable in various forms of headache.

It excites in the stomach a sensation of warmth, and slight pain, which may be mistaken for hunger, whence the notion that mustard sharpens the appetite, and promotes digestion; it has been proved, however, that mustard does not increase the secretion of gastric juice.

It is strange that a substance which acts so powerfully on the skin should affect so slightly the mucous membrane of the stomach, for considerable quantities may be swallowed without other effect than the production of nausea and sickness. The mild action of mustard on the mucous membrane cannot be explained as arising from its expulsion by vomiting, for, even when retained, it only excites a little catarrh of the stomach. Mustard is used as an emetic when no other is at hand, and when no time is to be lost. Cases of obstinate and even dangerous hiccough are reported which have been immediately cured by drinking an infusion made with a teaspoonful of mustard steeped in four ounces of boiling water for twenty minutes, and then strained. The emetic dose of mustard is a tablespoonful stirred up in a tumblerful of warm water. This should be followed by free draughts of warm water.

Mustard appears to have very little action on the intestines, beyond making the motions moister.

With many persons even a very small quantity of mustard, or
ses greatly the pain of piles, and excites

severe itching at the anus. Piles, indeed, furnish a delicate test, as it were, and immediately tell patients when they have transgressed, even in slight degree, their restrictive dietetic rules. Thus a little excess of food, too rich in fat, a glass of champagne, etc., will, inevitably, aggravate the condition of the piles next morning, these becoming swollen, painful, and protruding.

Some of the active principles of mustard pass into the blood, but the action on the organs is unknown. It is reputed to be diuretic, but this is doubtful; the advocates of its diuretic action fail to discriminate between the cases in which it is supposed to be beneficial.

It is said to be useful in whooping-cough.

CAPSICUM

In this condiment is contained an acrid oleo-resin, to which the name capsicin is sometimes given. Some other constituents beside the oil and the resin are described.

Capsicum irritates and inflames the skin, producing redness, a sensation of warmth or burning, and even vesication, but its preparations are rarely employed as rubefacients. The tincture is sometimes lightly painted over unbroken chilblains, but it is inferior to the ointment of iodine. The following capsicum preparation of Dr. Rheims is highly lauded for chilblains:—

"Make a strong tincture of capsicum pods by steeping them for several days in a warm place, in twice their weight of rectified spirits of wine. Dissolve gum arabic in water to about the consistency of treacle. Add to this an equal quantity of the tincture, stirring it together with a small brush or a large camel's-hair pencil until they are well incorporated. The mixture will be cloudy and opaque. Take sheets of silk or tissue-paper, give them with the brush a coat of the mixture, let dry, and then give another coat; let this dry also, and if the surface is seen to be shining, there is enough of the peppered gum; if not, give a third coat. This paper, applied in the same way as court-plaster to chilblains that are not broken, and burns that are not blistered, speedily relieves the itching and the pain. It acts like a charm, and effects a rapid cure. The same with discoloured bruises. It likewise allays rheumatic pains in the joints." (*See* Iodine.)

My friend, Mr. Henry Buck, employs capsicum in recent lumbago, neuralgia, toothache, rheumatic pains, and acute torticollis. He infuses a large handful of crushed capsicum pods in a pint of hot or cold water for thirty-six hours; he applies a piece of lint soaked in this liquid to the affected part, covering it with thin gutta-percha. It never vesicates, and, indeed, a stronger preparation may be us
The effects, he says, are often very striking; for instance, it

acute torticollis in ten minutes. A quack doctor in the west of England, who told his secret to Mr. Buck, had long and successfully employed this preparation.

Powdered capsicum thickly sprinkled on a moist handkerchief, or on a piece of moist brown paper, applied to the skin is a pleasant, soothing counter-irritant, which seldom produces redness.

Preparations of capsicum have a burning tingling taste, and act on the mucous membrane as upon the skin. The tincture, as a gargle, in the proportion of a drachm to half a pint of water, is useful in some sore-throats, and may be applied under the same conditions which indicate the use of nitrate of silver. Thus, in the very early stage of tonsilitis or pharyngitis, either of these substances, both of which act as irritants, will check the inflammation; but when the deep parts have become involved, and the tissues are much swollen, irritants of all kinds do great harm. In malignant sore-throat, capsicum gargle may be used with advantage to stimulate the tissues to a healthier condition, and here, again, its action is similar to that of nitrate of silver. In relaxed throat, when the mucous membrane is bathed with a grey mucus, or with pus, the same gargle may be employed, although it is probably not superior to the glycerine of tannic acid. Whitla describes as a splendid gargle, "one drachm each of tincture of capsicum and of tannin to ten ounces of acid infusion of roses."

In the stomach capsicum acts as an irritant, and, in large quantities, will produce gastro-enteritis. It is often used as a condiment to spur digestion to greater activity, but whether it is effective in this respect is undetermined. The stomach becomes accustomed to capsicum, and at last large quantities have to be eaten to produce any effect.

I can endorse Dr. Lyon's strong recommendation of capsicum in dipsomania. Ten-minim doses of the tincture obviate the morning vomiting, remove the sinking at the pit of the stomach, the intense craving for stimulants, and promote appetite and digestion. It should be taken shortly before meals, or whenever there is depression and craving for alcohol. Capsicum also induces sleep, especially in the early stages of delirium tremens. Dr. Lyon sometimes gives twenty or even thirty grains made into a bolus with honey, and he repeats the dose in three hours if the first fails to induce sleep. He says this quantity does not disturb the stomach.

A draught composed of ten minims of tincture of capsicum, ten grains of bromide of potassium, a drachm of spirits of ammonia, taken several times daily, is very serviceable to dipsomaniacs; the bromide of potassium may in certain cases be omitted, and replaced by two minims of liquor arsenicalis, or by a few drops of tincture of nux vomica, or tincture of orange-peel.

eful in summer diarrhœas, and in diarrhœas persisting after the expulsion of the exciting irritant. It is used in flatulence.

CANTHARIDES (*See* COUNTER-IRRITATION)

IN some respects this is the most important of the group of counter-irritants to which belong the two preceding drugs, mustard and capsicum. The external use of the Spanish-fly has been fully considered under the heading of Counter-Irritation, and we may now consider the value of the drug internally.

The active principle of cantharides is an acrid crystallizable substance which, by the assumption of a molecule of water, forms an acid which combines with alkalies to form salts, the cantharidates.

Preparations of cantharides, taken internally, produce an unpleasant burning taste, and, if in large quantity, inflammation and vesication of the mouth may obtain.

The effect of cantharides on the stomach is in all respects similar to that on the mouth. Even small doses cause smarting in the œsophagus, pharynx, and stomach, but larger doses produce inflammation of these parts, and of the intestines, with much pain and difficulty in swallowing, with vomiting, and a diarrhœa of bloody and slimy stools, and often general peritonitis, with which last the system sympathizes, as indicated by high temperature and frequent pulse.

The active principle of cantharides passes from the stomach and intestines into the blood. Its passage, it is true, has not been chemically demonstrated, but the symptoms following the administration of this drug render this conclusion certain, for, after a large dose, all the indications of acute inflammation of the kidneys set in, with much irritation or even inflammation of the urinary and generative organs; besides, there may be, after a poisonous dose, headache, loss of sensibility, convulsions, and death.

The changes cantharidine produces in the blood are at present unknown.

The tincture or powder used to be given in cholera and epilepsy, but this treatment has now fallen into complete disuse.

Little is known of the separation of cantharidine from the body. It is conjectured that, being volatile, some may pass off by the lungs; but, if so, it produces, in its transit through the lungs, no apparent changes in the mucous membrane of the air-passages. Owing to the same property of volatility, some of the cantharidine probably passes off by the skin; in this act it is held to stimulate the integument, and hence the internal use of preparations of Spanish-*fly* as recommended by several eminent French dermatologists in psoriasis, eczema, lichen, and prurigo. The chief portion, however, of the active principles of cantharides escapes by the kidneys, and, as we have said, acts as a strong irritant to the urinary and sexual organs. It may, like oil of mustard, turpentine, or copaiba, produce hyperæmia of the kidneys, with bloody urine, which fluid may partially set into a jelly from the fibrine which it contains. This coagulation is said to be characteristic of congestion produced by these and allied substances. Camphor, in two to five grains, is said to remove this hyperæmia promptly.

The preparations of cantharides have been recommended on high authority in certain forms of Bright's disease, but this drug has for years past been regarded as a most dangerous drug in this disease.

The discrepancy respecting the effects of cantharides in this affection arises, perhaps, from the difference in the dose administered by various observers. I am convinced of its usefulness in acute Bright's disease, when the active inflammation and fever have subsided, as they invariably do about the fifth to the eighth day. A chronic state often follows the subsidence of the more acute stage, and the urine continues small in quantity, contains albumen, and perhaps blood. If, just at this time—that is, on the immediate subsidence of the acute inflammation—a one to three-minim dose of tincture of cantharides is given every three hours, the blood will almost always quickly disappear, while the albumen decreases more gradually, and the urine becomes more abundant. At a crisis like this, it is true that a like amendment not unfrequently takes place without any treatment, but the influence of the cantharides can often be put to a conclusive test. Thus to a patient in the condition described above, who is passing urine containing albumen and much blood, if we give the drug in the way pointed out, he will begin to improve; if, now, we withhold the medicine, both blood and albumen will return in their original quantity, and in this way both may be augmented and lessened again and again by intermitting and reverting to the cantharides. The restraining influence of cantharides over the blood is, however, speedier and more decisive than over the albumen of the urine. Sometimes, though it checks the greater part of the blood, a small quantity remains for some weeks. This is especially the case when the patient gets up, for even a small amount of exercise will often exert remarkable influence upon the renal bleeding, and merely sitting up in bed will in some cases increase the bleeding notably.

Cantharides, in similar dose, has been recommended likewise in the still more acute stage of Bright's disease, and also in that other extreme, viz., the late stage, when the kidney, having undergone fatty degeneration, secretes very little urine.

After its separation by the kidneys, cantharides acts as an irritant to the urinary tract, and it may be employed for this action in cystitis, in gonorrhœa, and in gleet. One drop of the tincture, though five are sometimes required, should be given three or four times a day; this treatment is particularly useful in cases where there is a frequent desire to make water, accompanied by great pain in the region of the prostate gland, and along the urethra, while at other times severe twinges of pain are felt in the same parts. The urine under these circumstances may be healthy, or it may contain an excess of mucus, or even a small amount of pus.

Women, especially middle-aged women, often suffer from a frequent desire to pass water, or an inability to hold it long; sometimes this occurs only in the day on moving about: in these cases micturition may cause no pain, neither is there likely to be any straining, and the urine will be natural. In other cases women cannot help passing a little urine on straining, or sneezing, or coughing. Sometimes both sets of symptoms are present, due apparently to weakness of the sphincter of the bladder. One or two drops of tincture of cantharides three or four times a day, will in many cases afford great relief to these troubles, and sometimes cure them with astonishing rapidity, even when the symptoms have lasted for months or years.

Tincture of cantharides is useful in the incontinence of urine of the aged, even when due to paralysis, sometimes also in that of children; in the case of children, however, it is inferior to belladonna. Unfortunately, each remedy fails in a not inconsiderable number of cases.

Lahousse finds that cantharides affects simultaneously the malpighian bodies, the renal tubules and the matrix of the kidney. The malpighian vessels are greatly congested, albumen, leucocytes, and a few red corpuscles escape, the epithelium covering the vessels and lining the capsule swell and desquamate, the endothelium of the vessels swells and may choke the vessels, the tubule cells swell, become granular and die. The tubules contain hæmoglobin in the form of brilliant red homogeneous cylinders. Leucocytes escape into the matrix. Other observers hold that the malpighian bodies are alone, or chiefly, affected.

A drop of the tincture, three times a day, will, in the majority of cases, abate or remove chordee.

Cantharides affects the generative organs. Large quantities of the drug congest and inflame these parts, and often produce erection of the penis, effects generally attributed to the sympathy existing between the genital and urinary tracts. It certainly excites the sexual appetite, and has often been given criminally for this purpose. Full doses of cantharides, twenty to thirty drops of the tincture, or half a grain of the powder with full doses of sesquichloride of iron and phosphoric acid, or nux vomica, three times daily, form a combination effective in some cases of impotence; in the impotence of old age, and in that resulting from self-abuse or sexual excess. has proved successful, and the patient has begotten children.

tharides and iron combined are useful in some cases of seminal emissions.

Cantharides has sometimes been successfully employed to produce abortion, but the danger is so great as to be deterrent.

When administered internally, preparations of cantharides should be freely diluted with mucilaginous drinks, *e.g.* barley water.

Within recent years Liebreich has introduced the cantharidate of potash as a treatment for lupus and tuberculous disease of the larynx and lungs. The treatment has not gained ground, but the reverse. The solution employed by Liebreich was of strength 1 in 5,000, and of this 8–16 minims were injected. The action of the drug must be very carefully watched, as it may cause much irritation of the kidneys, and the presence of any kidney mischief is held to contra-indicate it. The theory upon which it was introduced was that the cantharidin would increase the inflammatory reaction, at the site of any local irritation (weak spot, as it were), such as a tubercle focus would present, and that the consequent out-pouring of serum would be inimical to the life of the tubercle germ, also that at the same time the health of the surrounding tissues would be strengthened by the increased afflux of blood. This theory has not been established.

IPECACUANHA AND ITS PREPARATIONS

WHEN applied to the skin, ipecacuanha, after some time, produces a sensation of warmth, attended with redness, and the formation of papules; sometimes it even produces pustules, which on healing are said not to be followed by pitting or scarring.

It has a disagreeable bitter taste, and excites the flow of saliva.

In some persons the minutest quantity produces peculiar effects on the membrane covering the eyes and lining the nose and respiratory tract. Thus, on smelling the drug, or even entering a room where it is kept, such persons may be affected with swelling of the loose tissues around the eyes, with injection of the conjunctiva, repeated sneezing, abundant discharge from the nose, severe tensive, frontal pain in the head, much oppression at the chest, with frequent cough, and the signs and symptoms of bronchitis. Ipecacuanha thus will excite symptoms and appearances similar to those occurring in hay fever, that is, it will excite a certain catarrhal inflammation of the respiratory mucous membranes. It is highly probable that ipecacuanha will produce similar results in all persons, and that its action on individuals differs only in degree. It is probable, as we shall see, that ipecacuanha affects the mucous membranes generally.

Small doses produce in the stomach a slight sensation of uneasiness, with an increased secretion of mucus; larger doses excite nausea and a still greater secretion of mucus from the stomach and from the bronchial tubes. Increase of mucus, indeed, occurs with all na[illegible]cines, but ipecacuanha probably excites the secretion of mucus independently of its action as a nauseant and emetic. In animals large doses are stated to produce inflammation of the mucous membranes of the stomach, intestines, and bronchial tubes.

Ipecacuanha is frequently used in catarrh of either the stomach or lungs, and it is especially useful when the secretion from the lungs is scanty and tenacious, or if abundant is still tenacious.

In yet larger doses it produces both nausea and vomiting, and, like all other emetics, some general weakness, attended by sweating: if at this stage of its action there is any spasm present, it will relax this. Thus, in nauseating dose, the drug is both diaphoretic and antispasmodic.

It is a mild, tardy, but certain emetic. It produces repeated vomiting, unaccompanied by much nausea or prostration; in these respects, and also in its slighter action upon the bowels, it differs from tartar-emetic. Its tardy action renders it, however, an unfit emetic in cases of poisoning, the sulphates of zinc or copper being then preferable.

M. Chouppe, who has investigated the action of emetics, finds that after section of the pneumogastric nerve, the injection of apomorphia or tartar-emetic into a vein excites vomiting as quickly and abundantly as when the nerve is uncut, whilst emetin, the active principle of ipecacuanha, does not excite vomiting. As regards emetin, Sir Dyce Duckworth's experiments with this drug lead him to a similar conclusion. M. Chouppe concludes that apomorphia and tartar-emetic act directly upon the vomiting centre, and that emetin acts through the terminations of the pneumogastric nerve. It is, however, generally held at present that the emetic action of ipecacuanha is a double one, by peripheral irritation and by stimulation of the vomiting centre, after absorption.

Brunton states that emetin, injected hypodermically, paralyzes the vessels and greatly lowers arterial pressure, even whilst the heart contracts strongly; that next it paralyzes the heart, arresting it in diastole. This statement is in opposition to the results obtained by Sir Dyce Duckworth in his experiments.

On account of its slight irritant action on the mucous membrane of the stomach, and perhaps because of the strong movements which it produces in that organ when it excites vomiting, ipecacuanha is found useful in irritative dyspepsia, both of the acute and chronic kind. In such cases, and with some practical authorities, it is a favourite plan to give ipecacuanha occasionally in emetic doses. It is sometimes given to produce vomiting in the bronchitis of children, when the patient breathes with difficulty from the presence of mucus in the bronchial tubes. The movements of vomiting expel much mucus mechanically, and temporarily improve the breathing. From its mildness ipecacuanha is fitted for such cases, and as an emeti
delicate persons

The quantity required to excite vomiting varies greatly, the smallest quantity being sufficient for some, while others find large doses inoperative. As a rule, children require large doses, and babies only a few months old may need ten or twenty grains of the powder.

Few remedies are so efficacious as ipecacuanha in checking certain kinds of vomiting. In numerous instances I have witnessed the efficacy of drop doses of the wine administered every hour, or three times a day, according to the urgency of the case, in checking the following kinds of sickness:—

1. It will check the vomiting of pregnancy. This vomiting is not always of the same kind. In some cases it occurs only in the morning, and is excited by the first waking movements. This form will, in most instances, yield to ipecacuanha, taken in the way just described; but should it fail, the administration of the medicine to the patient on waking, and sometimes before any movement is allowed, will generally give relief. In other instances, the vomiting occurs not only in the morning, but also frequently during the day, recurring, indeed, whenever food is taken, and it may be so severe that the stomach rejects all nourishment, while during the intervals of meals there may be constant nausea and great loathing of all kinds of food. Vomiting and nausea of this kind will, in most instances, be immediately arrested by ipecacuanha, and upon this the appetite will return, and the stomach will then bear almost any kind of food. In certain cases ipecacuanha will check the nausea and vomiting, with the exception of the early morning attack, but this also, on taking a dose immediately on waking, will generally cease, though in some cases it defies treatment.

In other instances the early morning vomiting may be absent, and the attack may occur only on taking food, the sickness increasing in severity as the day advances, and becoming most severe in the evening. Should ipecacuanha, as is sometimes the case, fail to check this form of sickness, nux vomica will often give relief.

In some pregnancies, besides the sickness and nausea, there is much heartburn, and perhaps great flatulence, symptoms which in many cases yield quickly to ipecacuanha; but here again, should this remedy fail, nux vomica will generally afford relief, though the symptoms will yield more surely to a combination of both remedies. It is singular that while, in pregnant patients, ipecacuanha will remove excessive flatulence, when co-existing with sickness, yet if the flatulence occur without sickness this medicine is generally unavailing, and recourse must be had to nux vomica, charcoal, sulphurous acid, or sulpho-carbolate of soda; of all these drugs most reliance is to be placed on the sulpho-carbolate, in doses of five to fifteen grains dissolved in water, and administered immediately after a meal.

It has been stated that, in some instances, nux vomica succeeds when ipecacuanha fails, and this is notably the case when the tongue is coated with a creamy fur, when the stomach is out of order, and when there is much acidity and heartburn. In such cases both nux vomica and ipecacuanha may be given simultaneously.

It must be confessed, however, that in certain instances, at present unexplained, ipecacuanha fails to afford the expected relief. In such cases vomiting is possibly kept up by a displacement of the uterus, or by a chronic inflammation of this organ, or of its cervix, or os, as was long since pointed out by Dr. Henry Bennett; should this be the case, the treatment will have to be directed to the removal of these conditions.

2. Some women, who during pregnancy are untroubled by nausea and vomiting, suffer yet from both of these symptoms during the whole or part of the time of suckling. These symptoms begin usually after the first few weeks of suckling, and they continue until the child is weaned; they may be so severe, and produce so much exhaustion, as to compel the mother to wean her child prematurely. Great flatulence may accompany the nausea and the vomiting. Drop doses of ipecacuanha wine, administered three times a day, will generally cure these symptoms speedily.

3. Similar troubles to those just pointed out afflict some women at each menstrual epoch, occurring immediately before, during, or directly after the period. These cases, too, will generally yield to ipecacuanha.

4. The morning vomiting of drunkards may be treated by ipecacuanha; but this morbid state is more effectively controlled by arsenic.

5. The morning vomiting which sometimes accompanies general weakness, and is met with in convalescents from acute disease, may also be treated by this drug.

6. Ipecacuanha will often control at once the vomiting of children, suffering from acute catarrh of the stomach. Indeed, this remedy appears to exercise greater influence over the vomiting of children than over that of adults.

Arsenic succeeds admirably, likewise, in removing the vomiting of acute stomach catarrh, and either remedy may advantageously be given with aconite, to subdue the inflammation, and reduce the fever.

7. In whooping-cough ipecacuanha often removes or lessens the vomiting, when this is occasioned by the violence of the cough, although the severity of the latter may be in no degree lessened. Cases of vomiting from this cause occur, which are unaffected by ipecacuanha, but which yield immediately to alum. (*See* Alum.)

8. A species of vomiting occurs after meals, without nausea or pain, or even discomfort, the food being merely rejected partially, and often very little digested. This condition may persist a considerable

time, but ipecacuanha wine will, in many instances, quickly cure it. Arsenic, however, is a still better remedy.

Ipecacuanha, in my experience, proves of little use in the following forms of vomiting :—

(*a*) In children, where the vomited matters are composed of large hard lumps of curdled milk. In such a case, diarrhœa being present, lime-water mixed with the milk is the best remedy, but if the child is constipated, bicarbonate of soda should be substituted for the lime-water; should these remedies both fail, milk must be altogether excluded from the diet.

(*b*) Ipecacuanha is not as a rule useful in that form of vomiting met with in young children a few weeks or months old, who almost immediately after the ingestion of milk, reject it with considerable force, either curdled or not, perhaps through both nose and mouth. At the *post-mortem* examination nothing may be discovered to explain this fatal form of vomiting, but sometimes the mucous membrane of the stomach is extremely soft, and looks as if made of water arrowroot. This form of vomiting is best treated by small doses (one-third of a grain) of grey powder, or by calomel (one-tenth of a grain) hourly.

(*c*) In hysterical vomiting.

Ipecacuanha is sometimes effective in checking the vomiting from cancer of the stomach, and it has succeeded sometimes after the more usual remedies have entirely failed.

I have several times met with cases where the symptoms may be compared to rumination, the food, quite tasteless, simply regurgitating into the mouth, without any effort at vomiting. These patients often chew the food a second time and swallow it without distaste. There may be no other symptoms, though, so far as I have seen, this regurgitation generally occurs when the health is disordered. I have seen ipecacuanha or arsenic promptly remove this regurgitation, though it may have continued, with intermissions, for months or years.

Emetine excites in dogs diarrhœa, and even dysenteric stools. Ipecacuanha excites an increased production of mucus by the mucous coat of the intestines, and becomes in this way slightly purgative; it is reputed to assist the action of other purgative medicines, such as jalap. It is also stated that a grain of powdered ipecacuanha each morning, while fasting, will relieve constipation depending on great torpor of the intestines. The same treatment, it is said, will remove the dyspepsia frequently associated with constipation, and characterized by depression of spirits, some flatulence, coldness of the extremities, and by the food lying on the stomach "like a heavy weight."

Rutherford, in his experiments on fasting dogs, finds that ipecacuanha, when mixed with bile and introduced into the duodenum, is a powerful hepatic stimulant. He employed sixty grains, which dose did not purge, but it increased the mucus of the intestinal canal.

It is well known that this drug is largely and beneficially employed in dysentery. In some epidemics it answers admirably, while in others it appears to fail. Large doses are required, and will often succeed when small ones fail. Sixty to ninety grains of the powder may be given at a dose, and repeated if required; oftentimes this dosage is without the production of either nausea or sickness, but should these symptoms arise, they may generally be obviated, if the patient, after taking the drug, will remain quietly on his back. In chronic cases not requiring prompt treatment, it is a good practice to administer the first dose at night when the patient has gone to bed. Should the first few doses excite sickness, this soon passes away on persevering with the medicine.

E. S. Docker, who has had a very large experience of this treatment, extols ipecacuanha. He states that its effects in suitable cases are almost instantaneous, the motions in the very worst cases becoming natural in frequency and character. Ninety grains of the powder cut short at once very severe attacks of dysentery, not only restraining the discharge off-hand, but immediately freeing the patient from pain, while inducing natural stools without straining or griping. The disposition to relapse, so common in acute dysentery, is not observed after the ipecacuanha treatment, and there is no need for after-treatment, nor for any great precautions concerning the quality of the food. After a large dose, such as sixty or ninety grains, Docker recommends that there should be an interval of ten or twelve hours before repeating it, and should the bowels meanwhile remain quiet, that there be no renewal of the medicine. It is also recommended, as an alternative, that ipecacuanha should be injected, especially if the stomach rejects it. An injection into the rectum, three or four times a day, of half a drachm or a drachm of powdered ipecacuanha suspended in a small quantity of fluid, is very useful in acute and chronic dysentery.

The dysenteric diarrhœa of children, whether acute or chronic, will generally yield speedily to drop doses of ipecacuanha wine, hourly. The especial indications for this treatment are slimy stools, green or not, with or without blood. Vomiting, if present, as is commonly the case, affords an additional reason for the adoption of this treatment. After the first or second dose of the medicine, and generally before the diarrhœa is checked, the sickness will often cease. Sometimes it happens that although the ipecacuanha abates the number and the dysenteric character of the evacuations, yet supplementary treatment is required.

Without doubt the active principle of ipecacuanha enters the blood, and we have next to consider its action on the distant organs of the body.

It produces an increased secretion from the bronchial mucous membrane. Some maintain that this occurs only when ipecacuanha excites nausea, and that the action of the drug is due solely to the production of this physiological state, it being well known that during nausea an increased secretion takes place from most of the surfaces of the body, including the respiratory mucous tract. Others consider that it can affect this mucous membrane irrespective of the production of any sensation of sickness, and that this is the correct view is borne out by the powerful effect of even a minute quantity of this medicine on the bronchial tract of some persons, though the same dose may fail to produce sickness, or even nausea.

Rossbach, in his experiments on animals with the trachea exposed, finds that emetin, apomorphine, and pilocarpine administered through the blood increase the tracheal secretion, whilst atropin and its allies act in the reverse way.

Ipecacuanha in the form of wine is of almost constant use in bronchitis, especially during the early stages, when the expectoration is scanty and viscid, or if profuse is difficult to expel.

The successful use of a secret remedy by a well-known practitioner induced me, in conjunction with Dr. William Murrell, to try the effect of inhalations of ipecacuanha spray in those obstinate complaints, winter cough and bronchial asthma. Our observations were made during January and February, and whilst undergoing this treatment the patients took only coloured water, and continued their usual mode of living in all respects. First, in respect of winter cough, we made observations on twenty-five patients, whose ages varied between 45 and 72, with one exception, that of a woman aged 32; we purposely selected severe cases. The following general description of a typical case will serve in most points to illustrate the condition of all:—The patient will have been troubled with winter cough, perhaps for many years. During the summer the health is perhaps pretty good, but during the cold months, from October to May, there is cough, sometimes without any intermission, occasionally getting a little better, and then worse again on catching fresh cold; or perhaps the patient may lose the cough for a few weeks, but again relapses, taking cold on the slightest exposure. So short may be the breathing that the patient can walk only a few yards, especially in the cold air, and it is very hard work to get upstairs, and the patient is often quite unfitted for active life. The breathing grows worse at night, so that there is no sleep unless with the head propped up by several pillows. There is moreover a paroxysmal dyspnœa, occurring usually at night, which may last several hours and constrain the patient to sit up. Sometimes the breathing is difficult only on exertion; in most cases fogs, east winds, or damp, make it much worse. The expectoration, generally difficult to expel, varies greatly. In a few cases there is very little; usually, however, it is rather abundant, often with little or no rhonchus. The cough is very violent, frequent, hacking, and paroxysmal, and the fits may last from ten to twenty minutes, and even excite vomiting. They are generally brought on by exertion, and, in bad cases, are so easily provoked that the patient is afraid to move, or even to speak. The cough and expectoration are much worse in the morning on waking. Sometimes the cough is slight, and the expectoration scanty, as a rule, the distressed breathing being the chief symptom. The patient generally wheezes loudly, especially at night, and is emphysematous; rhonchus may be absent, or there may be sonorous and sibilant sounds, or some bubbling rales at both bases.

In this common but obstinate complaint our results have been very striking, although so bad was the breathing in many of our patients that, on being shown into the out-patients' room, they dropped into a chair, and for a minute or so were unable to speak, except in monosyllables, having no breath for a sentence. We used the ordinary spray producer with ipecacuanha wine, pure or variously diluted. At first the spray will sometimes excite a paroxysm of coughing, which, however, will in general soon subside, but should it continue a weaker solution must be used. The patient soon becomes accustomed to the treatment, and learns to inhale the spray freely into the lungs. At first a patient will often inhale less adroitly than he learns to do afterwards, as he is apt to arch his tongue so that it touches the soft palate, and in consequence less spray enters the chest than when the tongue is depressed. The spray will sometimes produce dryness or roughness of the throat, with a raw and sore sensation beneath the sternum; sometimes it will cause hoarseness, whilst, on the contrary, some hoarse patients recover their voice with the first inhalation. As the inhalation is proceeded with the patients feel it getting lower and lower into the chest, till many say they can feel it as low as the ensiform cartilage.

The dyspnœa is the first symptom relieved by this treatment, and the first night even, after the spraying, the paroxysmal dyspnœa will often be improved, and the patient may get a fair night's rest, although for months before shortness of breath and coughing had caused the sleep to be much broken. The difficulty of breathing on exertion also tends to abate quickly, and often, after only one administration, the patient has walked home from the hospital feeling much easier than when he came. This improvement is continuous, and is such that in one or two days, or a week, the patient is able to walk with very little distress. The improvement is most marked immediately after each inhalation, and although after some hours the breathing may again grow a little worse, some permanent improvement is gained, unless the patient catches a fresh cold. I have heard patients say that after a week's treatment they could walk two miles with less respiratory distress than they could walk a hundred yards before the use of the spray. In some instances two or three days' daily spraying may elapse before any noticeable improvement takes place, this comparatively slow effect being sometimes due to awkward inhalation, owing to which but little ipecacuanha passes into the bronchial tubes. The effect on the cough and expectoration is also very marked, both of these symptoms decreasing greatly in a few days; in these respects, however, the improvement is rather slower than in the case of the breathing. Sometimes for the first few days the expectoration may be rather increased, but it speedily alters in character, so that it is expelled much more readily, the cough thus becoming easier, even before the expectoration diminishes. Owing to these results the patient is soon enabled to lie down at night with the head lower, and within a week or ten days, sometimes earlier, can do with only one pillow, an improvement occurring in spite of fogs, damp, or east winds, nay, even though the weather gets daily worse, and the patient is exposed to it the chief part of the day. The patients on whom these observations were made all came daily to the hospital, though, of course, it would have been much better to have kept them in a warm room had it been possible.

Of the twenty-five cases all were benefited except one. In one case the improvement was very gradual, but each inhalation produced a perceptible temporary improvement. In twenty-one cases the average number of inhalations required was 9·4, and the average number of days was twelve before the patients were discharged cured. The greatest number of inhalations in one case was eighteen and the smallest three. The case longest under treatment required twenty-four days, the shortest four.

In order to ensure, as far as possible, the topical effects only of the ipecacuanha spray, we were careful to direct the patient to spit out, and even to rinse out the mouth at each pause in the administration, for far more wine collects in the mouth than passes into the lungs. If this precaution is not adopted, enough is sometimes swallowed to excite nausea, and even vomiting, by which means the bronchial mucus is mechanically expelled, and of course in this way a temporary improvement is effected. However, even when this precaution is observed a protracted inhalation may excite nausea, and sometimes vomiting, by the absorption of the wine *viâ* the bronchial mucous membrane; but, strange to say, vomiting, when thus induced, has been long delayed, even to the extent of several hours, and sometimes it has been delayed till the evening, though the inhalation was used in the morning. In our cases, however, the improvement was not due to the nauseating effects of the spray, for we took care to avoid this contingency by administering a quantity inadequate to produce this result. The duration of each inhalation will depend upon the amount of spray produced by each compression of the elastic ball, and upon the susceptibility of the patient to the action of ipecacuanha.

As a rule, the patient will at first bear about twenty squeezes of the ball without nausea, and soon will bear much more. After two or three squeezes, especially on commencing the treatment, we must pause awhile. It is necessary to look at the patient's tongue, and teach him how to depress it, for if the tongue is much arched it will hinder the passage of the spray into the lungs. It is a good plan to tell the patient to close the nose with the fingers, and to breathe deeply. The inhalation should be used at first daily, and in bad cases twice or thrice daily, afterwards every other day will suffice, and the interval may be gradually extended. If the ipecacuanha wine is diluted, then the spray must be used for a longer time. In cold weather the wine should be warmed.

We have tried the spray with very satisfactory results in a few cases of a more severe, though closely allied, disease, which may be thus summarized:—A patient has suffered for several years from severe "winter cough," with much dyspnœa, cough, and expectoration, and on several occasions has spat up a considerable quantity of blood. The physical signs denote slight fibroid consolidation, with excavation at both apices, but with much emphysema, perhaps atrophous in kind. There is little or no rhonchus, and no fever. The expectoration may be slight or very abundant, muco-purulent, or purulent. The dyspnœa is perhaps so very severe and so paroxysmal as to justify one's calling the case bronchial asthma with emphysema and fibroid phthisis.

In this class of case the ipecacuanha spray is almost as beneficial as in that previously described. The spray soon controls the dyspnœa, thus enabling the patient to sleep, it likewise greatly lessens expectoration and cough, and by these means greatly improves the general health. As in the previous cases, the first inhalation may considerably improve the breathing, though the effects are not permanent, the dyspnœa returning in the evening, and hence the spraying is needed both night and morning, and may be required for weeks or months, the ipecacuanha appearing rather to mitigate, than to permanently cure, the dyspnœa.

We have used this spray in cases of true and severe bronchial asthma, with very opposite results. In one severe case, accompanied by a great deal of bronchitis, it gave very great relief. The other patient, not so ill, had been all his life asthmatic, and on catching even a slight cold his breathing would become greatly oppressed. In this instance each application of the spray considerably aggravated the dyspnœa, even though the wine were diluted with an equal quantity of water. A still weaker solution might possibly have been borne, but we are inclined to think that in this case any quantity of ipecacuanha would have disagreed, for the tightness of breathing increased almost immediately on commencing the inhalation. The successful case was a very severe one. For years this patient, a woman, had suffered from bronchitic asthma, and when she applied to the hospital she was unable to lie down, owing to violent paroxysmal dyspnœa. The worst attack would begin about 3 a.m., compelling her to start out of bed and struggle for breath. She was very emphysematous, the expiration enormously prolonged. She was very hoarse. The first inhalation removed the hoarseness in a few minutes, and much improved the breathing, which continued freer until midnight, when the dyspnœa returned. The cough became easier, and she expectorated more freely. Each inhalation gave her very great and marked relief. On her first visit she had walked to the hospital with great difficulty, having been constrained to stop frequently. On entering the room she could not speak, but laboured violently and with loud wheezing to get her breath. A few inhalations set the breathing gradually free, the air entering more and more freely, with gradual diminution of the wheezing, till, by the completion of the inhalation, she was able to breathe without difficulty. As the breathing improved she could feel the spray descending lower and lower into her chest. At first it seemed to reach only as far as the back of the tongue, then to the top of the sternum, the mid-sternum, and at last she felt as if it reached as low as the pit of the stomach. This improvement, which was observed on this and on subsequent visits, was maintained throughout the day, but towards evening a relapse would occur; her nights, however, though at first bad, were still decidedly better than before the treatment had begun. Soon, on persisting with the treatment, the effects became more lasting, and the patient slept well. On discontinuing the spray, however, the breathing again grew worse, and she was obliged to revert to the treatment; but, unfortunately, so easily did she catch cold, and so bad was the weather, that she was obliged to stay away for days together. Along with the improvement in the breathing, the cough and expectoration also mended, but these two symptoms continued rather troublesome. So marked was the benefit from the spray that the patient and her friends expressed their astonishment, especially at the prompt relief which it gave.

We have tried the spray in several additional cases of genuine asthma, but with unsatisfactory results, for in most cases it has considerably tightened the breathing to such an extent even that patients have refused to give it a second or third trial.

We have continued to carry on our observations with the ipecacuanha wine spray, and with results confirmatory of the statements made in the *Brit. Med. Journal.* We find, however, that some patients are very intolerant of the spray, a good deal of irritation, and even tightness of breathing being caused by it. It is advisable, therefore, at first, to dilute the wine with one or two parts of water, a precaution especially needful in the case of patients affected with much dyspnœa, and with lividity; for the spray may for some hours much intensify the difficulty of breathing and the lividity, and so alarm the patient and friends.

It may not be much out of place to mention here that, in several instances, we have found the spray very serviceable in non-febrile inflammatory sore throat, where the mucous membrane is swollen and very red. We have found it useful also in hoarseness due to congestion of the vocal cords. When the hoarseness has lasted a few days only, or one or two weeks, the spray often cures it speedily; but when the hoarseness has persisted for three months, or longer, the spray, though improving the voice considerably, leaves some hoarseness.

The late Dr. Hyde Salter recommended ipecacuanha strongly in hay-asthma, and in other forms of asthma, employing it to cut short a paroxysm of dyspnœa. He thought that, in common with tobacco and antimony, it controlled by virtue of its action as a depressant. He preferred it to the other two remedies just named, and gave it in doses large enough to cause depression, but too small to excite vomiting. Like other depressants, when thus employed, it must be given at the very beginning of the attack of dyspnœa, for the influence of the remedy is considerably less over a fully developed attack. He preferred the powder to the wine, and seldom gave less than twenty grains. This treatment, directed only against each attack of dyspnœa, leaves the complaint in other respects untouched, and more permanent relief has to be sought in appropriate diet and suitable climate.

Dr. Hyde Salter enforced particular attention to the influence of diet on pure asthma. As persons prone to asthma suffer from tightness of the breath for some hours after a meal, and the smallest quantity of food greatly aggravates an attack of asthma, therefore the meals must be small and digestible. Asthmatic attacks occur commonly at night, seemingly favoured by sleep, and the keeping awake will often ward off an attack. The attacks are especially liable to occur after a late meal, therefore an asthmatic should take a light tea, and go without supper; in fact, should take no full meal after two o'clock. Breakfast should be the chief meal. Asthmatics should rise early, to avoid a too prolonged fast. Their food must be plain, well cooked, and nutritious. Milk and eggs form a good diet. Cocoa is better than tea, but milk is better than either. Mutton is preferable to beef or lamb, while pork and veal must be prohibited; new boiled potatoes and succulent vegetables may be permitted. Fish is suitable. Cheese, dessert, preserved meats or fruits, must not be eaten, and stimulants of any kind are generally bad. Heavy malt liquors, especially those containing much carbonic acid, are the worst beverages. The quantity of food should not be large, although food does not produce the paroxysm by its bulk, as the attack generally occurs some hours after a meal, when the stomach is becoming empty. Most asthmatics may eat what they like at breakfast. Dr. Pridham, who has had great success in the treatment of asthma, and who long ago pointed out the importance of a regulated diet, orders the following regimen :—Breakfast, at eight, half a pint of tea or coffee, with a little cream, and two ounces of dry, stale bread. Dinner at one, two ounces of fresh beef or mutton, without fat or skin, two ounces of stale, dry bread, or well-boiled rice. Three hours after dinner, half a pint of weak brandy-and-water, or toast-and-water *ad libitum*. Supper at seven, two ounces of meat, and two ounces of dry bread. He prohibits drinking for an hour before dinner or supper, and till three hours after meals. When digestion has improved, he allows three ounces of meat twice a day. Dr. Salter gives the following excellent remarks on the climates suitable for asthmatics:—

(*a*) Residence in one locality will radically and permanently cure asthma resisting all treatment in another locality.

(*b*) The localities most beneficial to the largest number of cases are large, populous, and smoky cities.

(*c*) The effect of locality depends probably on the air.

(*d*) The air which would be imagined to be the worst for the general health is, as a rule, the best for asthma; thus the worst parts of cities are the best, and conversely.

(*e*) This is not always the case, the very reverse holding sometimes.

(*f*) There is no end to the apparent caprice of asthma in this respect.

(*l*) There is possibly no case of asthma that might not be cured if the right air could be found.

(*m*) The disposition is not eradicated, but merely suspended.

In many cases of whooping-cough ipecacuanha will often lessen the severity and frequency of the paroxysms, and frequently arrest the attendant vomiting. Dr. Phillips, and some other observers, consider ipecacuanha especially useful when the attacks of coughing are accompanied by retching and vomiting. Like other whooping-cough remedies, ipecacuanha often fails in cases apparently in all respects similar to those it benefits, and in certain epidemics it appears to be all but useless.

Ipecacuanha is also held to be a diaphoretic. Of course it will excite sweating when it excites nausea, but even irrespective of this condition it is maintained that it promotes perspiration.

It has been highly praised for its efficacy in hæmorrhages, as, for instance, in epistaxis,[1] bleeding from the lungs or womb, and in flooding after delivery. Some of its advocates give drachm doses of the powder.

In flooding after delivery Higginbotham recommends ipecacuanha in quantity sufficient to produce vomiting, and to this effect he ascribes its great efficacy in arresting hæmorrhage. In his hands this treatment succeeded in the most desperate flooding cases, but it may well be doubted whether, beyond its emetic effect, ipecacuanha exerts any influence over uterine hæmorrhage. Zinc would perhaps answer equally well. Dr. George Bird tells me that he once witnessed, in the case of a Syrian Jewess, the prompt suppression of flooding by the nurse, who crammed down the patient's throat a handful of her hair. Probably the mechanical excitation of vomiting would prove useful in flooding.

Ipecacuanha acts more surely as an emetic when given in divided doses, at short intervals, *e.g.* five grains in a little warm water every five or ten minutes.

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[1] Dr. Martin, of Geneva, arrests epistaxis (the blood generally coming from one nostril) by compressing the facial artery of the side affected upon the upper jaw, near the nose, thus lessening the supply of blood to the nose.

APOMORPHINE

THE hydrochlorate of this derivative from morphine is employed in medicine.

Apomorphine was obtained by Mathieson and Wright and first tested experimentally by Gee, who discovered it to be a very prompt and certain emetic. The hydrochlorate is official in solution in water, 1 in 50.

Apomorphine, after absorption, first excites the cerebrum, producing delirium and finally paralyzing it. It may excite convulsions, the cause of which "cannot be considered as made out" (Wood). According to Reichert's observations it acts also upon the sensory and motor nerves, first stimulating and then paralyzing them. Harnack and also Reichert find that it is a muscular (muscle fibre) paralyzant.

Upon the circulatory apparatus the effect is, for large doses, depressant—the arterial pressure falling and also the force of the contractions of the heart. Its action upon the heart is a direct one, at any rate in part, for it will influence the excised frog-heart. It is said to stimulate the vaso-motor centre and cause in the first instance a rise in blood-pressure; the subsequent fall is due partly to the weakening of the heart, perhaps also to a depressant action upon the vaso-motor centre. The pulse-rate is first accelerated, subsequently retarded. The respiratory centres are first stimulated (accelerated breathing), then weakened (shallow and infrequent respiration).

The most important effects of apomorphine are (1) upon the stomach, emetic action; (2) upon the bronchial mucous membrane, expectorant.

Emetic action.—This is readily excited without or with very little nausea; one-tenth of a grain hypodermically acts, often, in one or two minutes, it may delay ten minutes, or for smaller doses longer still. This action is upon the vomiting centre directly. The drug will excite vomiting also when absorbed from the stomach, but its action then is much less prompt, and larger doses are required.

The emetic action of apomorphine is of particular value in cases of poisoning, when it is necessary to produce prompt and certain vomiting, as *e.g.* in cases of drunkenness, opium poisoning, etc. In such cases as much as one-fourth of a grain may have to be administered. Apomorphine, however, is liable to cause much depression, and in feeble persons collapse; in children, especially, it requires very cautious use, or it may give rise to dangerous symptoms. Inasmuch as narcotic poisons deaden the sensibilities of the nerve centres, it is evident that the action of apomorphine will be influenced here by the degree of narcosis produced; but other emetics are also influenced in the same way, "and the probabilities seem to be that the alkaloid produces vomiting more surely than do our ordinarily used drugs" (Wood).

It has been suggested that morphia solutions may on keeping develop some apomorphine and thus acquire emetic powers: there is no evidence of this.

The *bronchial secretion* is increased by apomorphine hydrochlorate by a direct action upon the mucous glands of the respiratory tract, or by a stimulation of the glandular nerve endings, *i.e.* by a peripheral action—this was shown by Rossbach. The drug is adapted to the early stages of inflammation of the larynx, trachea and bronchi, when the mucous membrane is swollen, and hyperæmic, and secretes a viscid mucus. In croup and in the acute bronchitis of children it is thus of signal use. It is likewise of value in *chronic* catarrhs of the bronchial tubes if the secretion is scanty and tenacious. In these conditions it increases the expectoration, loosening it at the same time. Whitla finds it "the only drug of real value in dealing with some forms of bronchial irritation caused by the inhalation of flax dust in operatives employed in the manufacture of linen, whilst it afforded the best results in ordinary dry catarrhs, and especially in asthma." He recommends $\frac{1}{8}$ grain every three or four hours in camphor water with or without morphia or ipecacuanha. Binz recommends $\frac{1}{60}$ to $\frac{1}{30}$ grain every two hours, and it is perhaps wisest to begin with these smaller doses, increasing according to circumstances. The dose has been advanced by Murrell to the extent of one grain three or four times daily without producing nausea. The expectorant action of apomorphine is probably quite independent of the production of nausea, though it will be further increased by the latter action. Apomorphine may with advantage be combined in the form of a linctus with morphine or with codeine, $\frac{1}{20}$ or $\frac{1}{25}$ grain of the apomorphine to each dose.

In some outside affections it has been employed as follows:—

It is said to be useful in some hysterical affections.

It has cured a case of persistent hiccough when the hypodermic injection of morphia and atropia had failed.

Weil confirms Gee that it is useful in chorea.

Ludwig and Burgmeister have shown that apomorphia is a topical anæsthetic equal to cocaine, so far as the eye is concerned, but that it induces vomiting and salivation by absorption, and is hence disqualified. Six to twelve drops of 2 per cent. solution are needful. The application is painful.

VERATRUM VIRIDE

THE rhizome and rootlets of the green hellebore contain several alkaloids, but chiefly two, jervine and veratroidine; the latter is said to be composed of a mixture of alkaloid and resin. Of late the alkaloids have suffered from a change of nomenclature, with some little confusion as a result. The above names may stand for the present. The action of these alkaloids has been elaborately studied by Professor H. Wood.

In small dose the crude drug first reduces the force, with much diminution in the frequency, of the pulse, which may fall to half its natural number. At this stage exertion induces very great frequency of the heart's action, and the pulse becomes feeble, thready, and even imperceptible. A poisonous dose induces a very rapid thready pulse, a cold, clammy skin, nausea and vomiting, great muscular prostration and partial unconsciousness.

Wood finds that jervine affects the heart directly, either through its ganglia, or by its action on the muscular substance, also that it depresses powerfully the vaso-motor centre, and the spinal cord. Veratroidine is more irritating than jervine, and induces vomiting and occasionally purging, though the muscular twitchings and convulsions are less. It differs from jervine in powerfully paralyzing the respiratory centre, hence after poisoning, unless artificial respiration is maintained, arterial pressure becomes greatly heightened; this rise is asphyxial, for with artificial respiration arterial pressure steadily falls, as it does with jervine. Wood, speaking of the crude drug, says: "Veratrum viride is a powerful spinal and arterial depressant, exerting little or no influence upon the cerebral centre. In full therapeutic doses it lowers the pulse-rate, both by a direct action on the muscle (jervine), and by stimulating the inhibitory nerves (veratroidine); it diminishes the force of the heart's beat by a direct influence on the cardiac muscle (jervine), and produces a general vaso-motor paralysis (jervine)."

Veratrum has been said to lower the temperature in health; but, according to the late Dr. Squarey's observations, this is not the case.

Veratrum viride has been employed in the convulsions of children, chorea, typhoid fever, scarlet fever, measles, pneumonia, and pleurisy. In regard to pneumonia and pleurisy, some authorities consider that veratrum is useful only in the sthenic forms, acting then like tartar-emetic or aconite; others, however, as confidently recommend this remedy in the asthenic forms. The tincture of veratrum viride should be used, since veratria does not produce the same effects.

In the treatment of the foregoing diseases it is better to give small doses, such as one or two minims every hour, rather than larger ones at longer intervals. It is requisite to augment the dose gradually, in order to keep the pulse-rate down, otherwise it will sometimes suddenly rise to 120 or 140 beats, which rise, however, a small increase of the dose will reduce again in a few hours. On account of its irritant powers, it is not suitable for cases marked by gastro-intestinal irritability.

Veratrum is said to be efficacious in removing the pain of a rheumatism, and in controlling and shortening the fever. J said to be of service in neuralgia, sciatica, and lumbago, and in the "congestive headache" which occurs at the menstrual period.

Veratrum album, or the white hellebore, has been used with success in the vomiting and purging of summer diarrhœa; it possesses properties very like those of green hellebore.

Veratrum viride and v. album are now very little used, hence it is probable that the accounts of their usefulness have been very much overdrawn.

VERATRIA

THIS alkaloid[1] is obtained from the seeds of *Veratrum sabadilla*, or schœnocaulon officinale.

Veratrine (from Sabadilla seeds) is a local irritant, especially to mucous membranes, and hence when inhaled or taken internally it excites sneezing, vomiting, purging, and accompanying these signs of irritation there may be with large doses violent twitchings, and convulsions, and afterwards great muscular weakness with loss of electric irritability. The latter effects are the result of absorption.

The alkaloid passes readily into the blood, as is sufficiently proved by the symptoms it occasions; these are:—Dull, heavy, frontal headache, sometimes accompanied by shooting or stabbing pain over one or both brows, in the pit of the stomach, and at the region of the heart; the heart is greatly affected, for the pulse grows slow and weak, and may sink from 70 or 80 to 40 or 35 beats in the minute, becoming at the same time so feeble as scarcely to be felt at the wrist; pushed to the full extent, the drug greatly prostrates the muscular strength—to the extent, perhaps, of rendering walking impossible, and the muscles may twitch and jerk spasmodically; the surface is bedewed with a clammy sweat, the features are pinched, and there may be complete blindness and deafness, but delirium is rare. Dangerous as these symptoms appear, yet they speedily pass away if the drug is discontinued. Some self-experimenters have experienced dull aching pains, made worse by movement, and tonic and clonic contractions of the muscles, sometimes violent, especially in the muscles of the face and extremities. Veratrine has the same prostrating effect on birds, and in America it is hence sometimes used to catch them, by rendering them temporarily too weak to fly; but if left awhile, the effects of the drug pass off, and the birds escape.

In respect of the effect upon the heart it is noted that the pulse, in the first instance, is quickened and strengthened, then slowed, and afterwards it becomes quick, weak, and irregular. The twitchings and convulsions of the skeletal muscles are due, probably, in part to

t quite pure.

the effect of the veratria on the muscles, in part to that upon the cord.

The twitchings and convulsions are not produced by the action of veratria on the brain, since they occur after section of the spinal cord. They are partly due to the direct action on the muscles, for they take place when the cord is destroyed, and, further, in animals whose nerves are paralyzed by curare.

Veratria is a powerful muscle poison, and affects curiously the character of the contraction, acting in this respect much like calcium salts and alkaline soda salts, as, for instance (of the latter) the phosphate and bicarbonate of soda. On stimulation the affected muscle contracts and relaxes, or partially relaxes, like a normal muscle, but then it rapidly contracts again and then very slowly relaxes. On repeating the stimulation this effect of veratria speedily wears off, and some time has then to be allowed before the muscle regains its original abnormal condition. This affection of the muscle causes the movements of the animal to be stiff and awkward. Sometimes the muscular contraction will persist so long as to suggest a tetanus of spinal origin, as in strychnia poisoning, but in disproof of this we shall note that this effect of veratria on the muscle occurs also when the limb is separated from the trunk. In frogs under the influence of veratria marked fibrillary contractions occur, looking much like the fibrillary contractions in progressive muscular atrophy. These fibrillary contractions in the frog must be due to the action of the poison either on the muscle or on the motor nerves, for they occur in an amputated limb on stimulating the nerve. Since they almost disappear when curare is administered, these twitchings are probably due to some alteration in the motor nerves.

Veratria affects the cardiac muscle much as it does the skeletal muscle, but it is less poisonous to the heart than to voluntary muscle. In a cardiac contraction it greatly delays diastolic dilatation, and induces irregular rhythm.

Applied to the skin veratria ointment excites a sensation of warmth and of pricking, followed by coldness. Unless applied for some time it does not excite inflammation, but prolonged application produces a red itching rash. It is a very efficacious remedy in neuralgia, and, like aconite, has most influence over neuralgia of the fifth nerve. An ointment of the Pharmacopœial strength is generally strong enough when applied to the face, but in other neuralgias a stronger ointment is required.[1] Dr. Turnbull, who employed veratria ointment largely, used a preparation containing twenty and sometimes even forty grains to the ounce; the B.P. strength is seven grains to the ounce. These strong ointments, not uncommonly, prove very useful in sciatica when rubbed along the course of the pain for twenty minutes to half an hour, twice or three times a day. The stronger ointments are sometimes useful in the neuralgic pain consequent upon shingles. The susceptibility to the action of veratria varies; thus, in some persons, it readily produces numbness and a sensation of coldness, which may last several days.

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[1] The B.P. ointment may exceptionally prove much too irritant, and it is well, therefore, to order a very light and limited application in the first instance, till the sensitiveness of the skin has been gauged.

Like aconitia ointment, it is useful in sick headache, when the pain is accompanied and followed by tenderness of the skin. It should be well rubbed in over the seat of pain at the very commencement of the attack. It excites less irritation, and sometimes succeeds better than the aconite preparation, very quickly subduing the pain, preventing the vomiting, and reducing the duration of an attack to one or two hours, or even to a few minutes, whilst previous to the veratria treatment it would last one, two, or three days.

Dr. Turnbull used a strong ointment to rheumatic joints, and no doubt it does relieve some cases, although, unfortunately, it more generally fails. He likewise employed a strong ointment to the painful joints at the onset of an attack of gout.

Turnbull also applied the ointment to the chest of patients suffering from heart disease, with rapid irregular pulse, hurried breathing, much lividity and dropsy, palpitation and inability to lie down—to cases indeed usually benefited by digitalis. These symptoms, according to him, the ointment not infrequently relieved with the production of a free diuresis, the patients passing a large quantity of urine, even six pints a day. Care must be taken, especially with the stronger ointments, not to apply them to the broken skin, or they will excite much pain and inflammation.

When sniffed up the nose the smallest quantity excites violent sneezing, which sometimes lasts for hours.

COLCHICUM

WHILE the physiological effects of colchicum are very similar to those of veratrum, yet one drug cannot be therapeutically substituted for the other.

Strong preparations of colchicum, applied to the skin, irritate, exciting redness, pricking and smarting, and the powder of colchicum sniffed up the nose excites sneezing and watery discharge from the eyes and nose.

Colchicum is acrid to the taste, produces much irritation of the fauces, with increase of saliva, sometimes in such quantity as might well be termed salivation.

Colchicum is an irritant to the stomach and intestines, and it produces these effects, whether swallowed or injected into the veins.

Small doses, continued for some time, produce a coated tongue and a disagreeable taste, and they impair the appetite, and excite more or less thirst, with pain at the epigastrium, rumblings of the stomach, and looseness of the bowels.

Should vomiting occur, the ejected matters are bilious, or are composed of mucus, and after a large dose they may contain blood. The stools are soft, or even liquid, and of a high colour, but after a large or poisonous quantity, though at first of the character just mentioned, they afterwards become dysenteric, consisting of slime and blood, and they are accompanied by much straining and by cutting pains in the belly. Even when injected under the skin, colchicum affects the intestinal canal in the same way.

Colchicum is rarely used in diseases of the alimentary canal. It has been employed as a cholagogue, and Rutherford, in his investigations, finds that colchicum in large doses given to fasting dogs, increases considerably the biliary secretion, and at the same time purges powerfully.

Colchicum, according to some, acts most serviceably in both gout and rheumatism *when it purges*, but others hold purgation to be not only unnecessary but injurious; there is no doubt that purgation is not necessary, and that colchicum may cure an attack of gout as quickly without purging.

Colchicum enters the blood speedily, and, in full doses, soon excites a feeling of warmth at the stomach, with a glow, and outbreak of perspiration, over the whole surface of the body, together with throbbing of the vessels, and reduction of the force and frequency of the pulse.

Poisoning by this plant, or its preparations, produces profound prostration (sometimes with pain in the head), pinched features, perspiration, clammy skin, small, weak, or intermittent quick pulse, and not infrequently strong muscular and painful twitchings; pains may be felt in all the extremities. A quantity sufficient to produce the symptoms just detailed congests and inflames the stomach and intestines. Colchicum is said also to cause pain in the urinary tract, with smarting on micturition.

The drug is reputed to be diuretic, and to stimulate, even in healthy persons, the secretion of a large quantity of urinary water and of uric acid, but these statements have not been confirmed by the observations either of Böcker or of Garrod, which observations show that if it act at all on the kidneys colchicum lessens, rather, the amount of water, urea, and uric acid.

To Garrod the profession is indebted for much information on the nature of gout. This philosophical observer has shown that in gout there is retention, with possibly increased formation, of uric acid in the system. From the urine of gouty patients very little, and, in some cases even, no uric acid can be obtained, while plenty can be detected in the blood, the alkalinity of which is lessened. The urates, thus circulating through the tissues, are deposited in the various parts of the body, and excite active and painful inflammation; the deposition is favoured by the diminished alkalinity of the blood.

It is argued, however, that urates are not deposited in the cartilaginous and fibrous tissues, for it is said, if so, they should be more abundant close to the vessels, whereas it is well known that they are earliest seen, and exist most plentifully, in cartilages, near their synovial surface—that is, at the greatest distance from the blood-vessels. Hence it has been maintained that the urates are not deposited, but are always associated in gout with much mal-nutrition, resulting in an excessive formation of urates which remain unabsorbed in the slightly vascular and non-vascular tissues, and hence, of course, accumulate in those structures most distant from the vessels. If this view is correct, the gouty inflammation cannot be set up by the irritation excited during the deposition of the urates, but is due to some hitherto undiscovered cause.

Colchicum, it is well known, gives prompt relief from the pain, inflammation, and fever of gout. But how? Does colchicum cause the elimination of uric acid from the system through the kidneys, and so remove the condition on which the gout immediately depends? Now since Garrod has experimentally shown that colchicum exerts no influence on the elimination of uric acid in gouty people, it is evident that colchicum must control gouty inflammation without in any way affecting the condition on which the gouty inflammation, in the first instance, depends. Hence colchicum should be merely palliative, removing for a time the patient's sufferings, but, as experience abundantly proves, in no way protecting him from their recurrence. This view, indeed, that colchicum is inoperative to prevent a return of the gouty attack, is generally accepted; nay, many who suffer from gout are of opinion that, while the medicine will remove altogether an existing attack, it ensures the speedy return of another. Hence, gout-ridden people commonly advise their fellow-sufferers to abstain from colchicum. A gouty sufferer, however, is apt to continue gout-engendering habits, and to forget also that, as he grows older, the gouty tendency becomes stronger.[1]

The effect of colchicum on the gouty inflammation is very rapid, for a large dose of the medicine, say a drachm of the wine, will often remove the severest pain in the course of one or two hours, and soon afterwards the swelling and heat will subside. Some observations, conducted by Dr. Rickards and myself, show that, while the pain is thus quickly subdued, the temperature of the body falls very little during the first day, but that on the following morning there is generally a considerable decline, and often a return to the healthy temperature; should the fall be postponed a longer time, then on the second day after the use of the colchicum a continuous decline of the temperature will take place, and all fever gradually disappear.

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[1] Garrod, speaking in 1896, says he has never witnessed any tendency to relapse after treatment by efficient doses of colchicum, *i.e.* no tendency which could be ascribed to the colchicum.

There are two methods of employing colchicum. Some advocate small doses, others give as much as a drachm of the wine for a dose, others two drachms even, at a time. The larger dose produces sometimes sickness, diarrhœa, and great temporary weakness, but it extinguishes the pain at once. Small doses give like results, but only after some days.

Colchicum is sometimes of use in the treatment of various diseases occurring in gouty persons; for instance, bronchitis, asthma, chronic urticaria and other skin eruptions, dyspepsia, etc. In these cases the colchicum is given as an *addition* to the special treatment, which the lung-, skin-, or alimentary tract-symptoms call for. Colchicum is sometimes used in chronic rheumatism and rheumatoid arthritis, but, I think, without any very apparent benefit.

Some persons are very tolerant of colchicum. To one gouty patient, a man, I gave at first two drachms and a half without any effect, on a subsequent day four, and on another day six drachms without any result. An ounce slightly relaxed the bowels, and ten drachms relaxed the bowels five times and caused a little sickness. No symptoms set in till ten hours after taking the medicine.

Colchicum is generally administered along with an alkali, magnesia by preference; the alkali is held to moderate or render less irritant the action of the colchicum.

PODOPHYLLUM

PODOPHYLLUM is a powerful purgative and cholagogue. Its active principle is resinoid and goes by the name of podophyllin, though analysis has shown it to consist of more than one body.

Dr. Anstie, who has studied the action of podophyllin on dogs and cats, found that in from two to ten hours after the injection of an alcoholic solution into the peritoneal cavity, and after the effects of the alcohol had ceased, podophyllin excited vomiting, and almost incessant diarrhœa. Dr. Anstie does not usually describe the character of the stools, but in one experiment he states that they consisted of glairy mucus, and in two other experiments the stools were highly coloured with what looked like bile. In many of the experiments the stools contained blood. The animals suffered great pain, and soon became exhausted. At the *post-mortem* examination the œsophagus was healthy, but the stomach somewhat congested: this may have been induced, Dr. Anstie suggests, by the violent efforts of vomiting. The small intestines, especially towards the lower part of the duodenum, were intensely congested, and in some stances the lower part of the duodenum was extensively ulcerated.

The large intestines were but slightly inflamed. Although the injections were poured into the abdominal cavity, the peritoneum itself was not at all inflamed, not even around some unabsorbed granules of podophyllin. The contents of the intestines were liquid. In all the instances in which the effect of the medicine on the heart and respiration is mentioned, respiration ceased before the heart stopped.

From these experiments, it appears evident that podophyllin has an especial affinity for the small intestines, and chiefly for the duodenum.

The Edinburgh Committee investigated the action of podophyllin on healthy non-fasting dogs, and their reporter, Dr. Hughes Bennett, stated that doses of podophyllin varying from two to eight grains diminished the solid constituents of the bile, whether purgation took place or not, and that doses which produced purgation lessened both the fluid and solid constituents of the bile. (*See* Mercury.)

Indeed, these investigators found that in non-fasting animals all the reputed cholagogues failed to increase the bile, and further, that if they purged they even diminished it. Some experiments by Röhrig on fasting animals being opposed to these statements, Dr. Rutherford was led to reinvestigate this question. He found that podophyllin injected into the duodenum of a fasting dog increased both the water and the solid constituents of the bile, and that this increase was greater when the bile was allowed to flow into the intestines than when it was drained off by a cannula. The augmentation of the secretion was greatest when the drug did not purge severely; indeed, when it did purge violently it might even lessen the biliary secretion.

Drs. Rutherford and Vignal confirm Röhrig's statements concerning the influence of other drugs on the liver secretion in fasting animals. They find that aloes, rhubarb, senna, colchicum, taraxacum, and scammony increase the biliary secretion; that podophyllin, aloes, rhubarb, colchicum, and croton oil are the most powerful biliary excitants, senna and scammony less so; and that they all increase both the water and the solids of the bile. Taraxacum they find is only a feeble hepatic stimulant. Rutherford thinks that these drugs act directly on the hepatic cells, and not indirectly by increasing the blood supply. Röhrig found that calomel given to fasting dogs would not recall the secretion when the flow had stopped, though the drug would increase it when the bile had only diminished. Drs. Rutherford and Vignal find, however, that calomel generally lessens both the water and the solids of the biliary secretion; fasting and non-fasting animals were thus alike affected.

Drs. Rutherford and Vignal endeavour to reconcile the apparently conflicting results of their experiments with those of the committee presided over by Dr. Bennett.

The absorption of food, they say, is undoubtedly followed by increased biliary secretion. The purgative probably diminishes the amount of food absorbed, seeing that the latter tarries a less time in the intestines, and this probably overbalances in the course of the day the stimulation of the liver. "When such substances as podophyllin, rhubarb, aloes, and colchicum are administered (*a*) the liver is excited to secrete more bile. (*b*) If purgation result, absorption of biliary matter and of food (if digestion is taking place) from the intestines is probably diminished, and thus by the twofold operation of increased hepatic action and diminished absorption of biliary matter from the intestine the blood as it passes through the portal system is probably rendered more pure."

Podophyllin produces very marked effects on the motions of children presenting the following symptoms:—During the early months of life, especially after a previous attack of diarrhœa, obstinate constipation may occur, with very hard motions, crumbling when broken, and of a clay colour, often mottled with green. Sometimes, at each evacuation, the passage of the hard stool through the sphincter of the rectum occasions great pain, causing the child to scream. At the same time there may be much flatulent distension of the belly, which distension excites frequent colic, this in its turn making the child cry, often without cessation. This morbid condition of the motions is frequently observed in children one or two months old, who are fed instead of suckled. I know nothing so effectual in bringing back the proper consistence and yellow colour to the motions as podophyllin. A grain of the resin should be dissolved in a drachm of alcohol, and of this solution one or two drops given to the child on a lump of sugar twice or three times a day. The quantity administered must be regulated by the obstinacy of the bowels, which should be kept open once or twice a day. Under this treatment the motions often immediately become natural, the flatulent distension of the belly gives way, and the child improves quickly. The restoration of the colour of the motions is probably owing to the increased secretion of bile induced by the podophyllin.

That disagreeable cankery taste, unconnected with alcoholic excess, generally occurring only in the morning, but sometimes continuing in a less degree all day, gives way, usually, to podophyllin; should it fail, mercury generally answers. This symptom, when due to constipation, is removable, it is true, by many purgatives, but podophyllin and mercury answer best.

In small doses, $\frac{1}{20}$ or $\frac{1}{30}$ of a grain, night and morning, podophyllin is useful in cases such as the following:—A busy, worried, overworked man, who takes perhaps too little exercise, feels all day, but especially in the morning, dull and depressed; his mind is inactive and indolent, and he is irritable. He complains also, perhaps, of a stupid feeling, is often bilious-looking, and dark round the eyes. Now these symptoms often, no doubt, accompany sluggish bow and can be relieved by any purgative, but they not uncommonly occur when the bowels are regular, and the motions natural in colour. In such a case, a small non-purgative dose of podophyllin is most serviceable. The resin may be made into small pills, or dissolved in rectified spirit in the proportion of one grain to two drachms of spirit; six minims of this solution should be taken night and morning in tea or coffee.

Small doses of podophyllin are highly useful in some forms of chronic diarrhœa. Thus a diarrhœa marked by highly-coloured motions and cutting pains is generally relieved by small doses of podophyllin; the bowels becoming regular, and the pain speedily subsiding. This medicine is especially indicated if this form of diarrhœa occur in the early morning, compelling the patient to leave the bed several times, but improving after breakfast, or by the middle of the day; sometimes the diarrhœa does not continue after breakfast, but ceases then, to return again early next morning. Podophyllin, indeed, will generally cure this morning diarrhœa, even though the motions are pale and watery. By means of podophyllin I have cured chronic diarrhœa of watery, pale, frothy motions, with severe cutting pains, even when the diarrhœa has lasted for many years. Two or three minims of the solution just mentioned should be given three or four times a day.

Podophyllin is very useful in some forms of sick headache (migraine). The nature and the order of the symptoms differ greatly in different cases of sick headache. Some, for instance, are accompanied by constipation, others by diarrhœa, and in each of these kinds the stools may be either too light or too dark in colour, but there are, besides, many other varieties of sick headache. When the headache is preceded, accompanied, or followed by a dark-coloured bilious diarrhœa, podophyllin generally does good. Two or three minim doses of the foregoing solution, given three times a day, will restrain the diarrhœa, lighten the colour of the motions, and if the medicine is persevered with, either prevent the attacks or considerably prolong the intervals. When the diarrhœa is of a light colour, and the motions evidently contain too little bile, a hundredth part of a grain of bichloride of mercury, given three times a day, is often very useful. Again, when the headache is accompanied by constipation, and the motions are of a dark, bilious character, a free podophyllin purge every day, or every alternate day, is very beneficial. Even in those nervous headaches occurring either just before, at, or directly after the menstrual period, if they be associated with constipation and dark-coloured stools, purgative doses of podophyllin will often give relief.

It is now generally held that in sick headaches, or, as they are often termed, nervous headaches, migraine, hemicrania, the origin of [illegible] is situated in some part of the central nervous system, and therefore it is asked—What is the use of giving medicine to act on the stomach, liver, or intestines?

But, allowing that the affection in migraine is situated in the central nervous system, yet the affection appears to be dormant till roused into activity by peripheral, or other exciting causes—causes in many cases due to the stomach, the liver, or the intestines. In such cases the sickness, the diarrhœa, or the constipation precedes the attack; when these symptoms accompany or follow the paroxysm, they may fairly be considered as part of the attack, depending on changes occurring in the central nervous system. The treatment of migraine, therefore, falls into three divisions: (1) removal of the exciting cause; (2) treatment of the condition of the central nervous system producing the attack; (3) treatment of the attack itself.

When sickness, diarrhœa, or constipation precede the paroxysm they act as exciting causes, and if we can remove these symptoms by the aid of mercury, or podophyllin, according to the foregoing directions, we prevent the development of the attack, or at all events render it milder. Even when these symptoms accompany the attack, and form, therefore, very probably, an integral part of the paroxysms, these remedies, or others like nux vomica, acting either on the stomach, or liver, may suppress the paroxysm.

The injection of podophyllin under the skin has been recommended. It is readily soluble in equal parts of liquor potassæ and water; and, if the drug is pure, the addition of water does not precipitate this solution. The injection of this solution to the extent of one-third to one-tenth of a grain quickly purges, sooner, it is said, than when given by the stomach, and it causes no pain.

Podophyllin is a rather uncertain purgative; thus, a dose adequate to purge one person violently will be inoperative in the case of another. Individual differences occur, it is true, with other purgatives, but the action of podophyllin appears more uncertain than that of other similarly acting drugs. Again, the time it takes to act varies, purgation sometimes occurring in a few hours, whilst at other times it may take twenty-four hours. Sometimes, instead of freely relieving the bowels, podophyllin frets them, by causing frequent attempts with ineffectual results. The pure drug causes very little griping. In too large doses it is very apt to produce slimy and bloody stools, particularly in children.

Podophyllin may be combined with calomel, or it may with advantage be added to the pill of colocynth and hyoscyamus, or to the compound rhubarb pill, with the further addition of one or two grains of the extract of hyoscyamus.

GUAIACUM

GUAIACUM has an acrid pungent taste, and promotes salivary secretion. It excites a sensation of warmth in the stomach, and increases the gastro-intestinal secretions. Large doses excite vomiting and diarrhœa. It is reputed to increase the secretion from the bronchial mucous membrane and from the skin.

Its usefulness is most conspicuous in tonsilitis, and in this affection it ranks with salicylate of soda and aconite, being, however, inferior to salicylate of soda. It is administered either in powder or as tincture, or in lozenge form. Brunton prefers the guaiacum mixture to the ammoniated tincture; but whatever their precise relative merits, there can be no question of the efficacy of the ammoniated tincture.

Half-drachm doses of the tincture may be given every three or four hours in a wineglassful of milk, or together with half a drachm of mucilage of acacia in an ounce of water. If purging occur, the dose may be lessened. The tonsilitis, if taken early, is rapidly aborted.

The lozenges of the *Throat Hospital Pharmacopœia*, each containing two grains of guaiacum resin, taken several times a day for a long period, are useful in follicular pharyngitis. They may be used also in acute tonsilitis, one every two hours (*Throat Hospital Pharmacopœia*).

It is recommended in rheumatic or neuralgic dysmenorrhœa. It is employed also in chronic rheumatism, chronic gout, lumbago, sciatica, and in chronic bronchitis.

Recently Sir Alfred Garrod has published results showing the use of guaiacum in the treatment of chronic gouty affections and its value in warding off acute attacks (*Medico-Chir. Trans.*, 1896). He thus sums up:—

"1. Guaiacum is an absolutely innocuous substance, and may be taken for an indefinite period of time; it may be looked upon rather as a condiment than as a drug; it is as innocent as ginger or any other spice.

"2. Guaiacum possesses a considerable power, less than colchicum, in directly relieving patients suffering from gouty inflammation of any part; it may be given whenever the patient is not very feverish.

"3. Guaiacum taken in the intervals of gouty attacks has a very considerable power of averting their recurrence, even over a lengthened period; it is, in fact, a very powerful prophylactic.

"4. Guaiacum from long-continued use does not lose its prophylactic power.

"5. Guaiacum, although it can be taken by most individuals, is apt in a few cases to cause irritation of the bowel, so as to prevent its administration as a remedy in gout. In such cases serpentary may be often substituted with advantage, although it is as yet doubtful whether it equals guaiacum in its prophylactic power."

He employs it therefore in the gouty attack, when this has become subacute, adding the guaiacum (ammoniated tincture) to the alkaline and colchicum treatment, or sometimes giving it in conjunction with iodide of potassium and citrate of lithium. As a prophylactic he gives the guaiacum in ten or twelve grain dose, with or without a small dose of iodide of potassium, the whole in the form of powder enclosed or not in a cachet, and this he washes down with an effervescent draught of citrate of lithium. This treatment administered early each morning, and continued for one, two or more years, has in his hands proved most successful.

Garrod also combines guaiacum resin and lithium in the form of the guaiacate of lithium, administered as pills; dose, 5 grains twice daily.

In those cases, rare ones, in which guaiacum cannot be well borne, because of bowel irritability, Garrod substitutes serpentary.

Garrod suggests that the prophylactic value of guaiacum may depend upon a stimulant action on the kidney, whereby this organ is caused to throw off any urate of ammonium held in its tissues, and so re-absorption of urate into the blood is prevented. He holds that uric acid is formed by the kidney from urea. He adds: "Without at present endeavouring to explain the action of guaiacum upon the urinary secretion, it is quite certain that it frequently causes the copious elimination of uric acid in the form of urates, which probably is in close relation to its efficacy in gouty cases."

SERPENTARY

THIS drug belongs to the class of the aromatic bitters; it is comparatively little used, yet, according to Garrod, is possessed of distinct powers in the treatment of gout. He says:—

"Cullen and others, who recognised the effect of guaiacum in arresting gouty attacks, considered that the same power resided, at any rate in some degree, in other medicinal substances, and practical experience has taught me that serpentary, the rhizome and rootlets of *Aristolochia serpentaria*, is one of these substances. When from any cause a patient is unable to take guaiacum for any length of time, a circumstance which seldom occurs, then serpentary seems to be able to take its place; and I have several patients, usually elderly men, who have found great benefit from this medicine in their gouty attacks, and several who have been most unwilling to be ever without it, but as yet I can give no such evidence of its prophylactic powers as I can in the case of guaiacum.

"I give the serpentary in the form of extract as well as in that of a tincture."

ACTÆA (CIMICIFUGA) RACEMOSA

THIS medicine is used much more extensively in America than in England. It has been employed for centuries by the Indians and settlers in many uterine diseases, and to stimulate the expulsive action of the womb, also in the treatment of chorea. Those with most experience of this drug speak loudly in its praise.

It has been compared to aconite by some, by others to digitalis. It slows the heart, but whilst some observers maintain that it weakens, others assert that it strengthens, each beat, and heightens arterial tension. In large doses it causes giddiness, dilated pupils, sleepiness, and sometimes a good deal of headache. It has been recommended for the dyspepsia of drunkards; also as an expectorant in bronchitis, for which some extol it: it is said to be useful in phthisis. It has been much commended in acute and chronic rheumatism, lumbago, sciatica, and myalgia. In lumbago and sciatica I have often tried it, but without success, though, from the strong recommendation of others, it must be useful in some cases. I have seen it very effective in some cases of rheumatoid arthritis.

According to American therapeutists, this plant operates powerfully on the uterus; its action on this organ is stated to be very similar to that of ergot, stimulating the contractions of the parturient uterus, and hastening the expulsion of the child. Ergot produces a continuous contraction of the uterus, while actæa, it is said, merely strengthens, but does not prolong, the contractile movements, and therefore endangers less the child's life and the soft structures of the mother.

Actæa is said to be useful in expelling the placenta and in preventing after-pains, but ergot is preferable, as it produces more persistent contraction. Actæa has been recommended in amenorrhœa, and dysmenorrhœa, also in menorrhagia; though inferior to other remedies, it certainly does control menorrhagia.

Again, when the menses have been suddenly checked from cold, shock, or mental emotion, actæa racemosa, it is said, will restore the flow and remove the symptoms of suppression; it is useful, also, when in similar circumstances the lochia are suppressed, and when distressing symptoms are apt to occur, such as more or less severe pain in the head, in the back, and down the legs, and the muscles are stiff and sore, and when further there are bearing-down pains.

It has been given, also, to prevent miscarriages due to irritable uterus and in prolapsus uteri.

Actæa is said to be serviceable in that common and distressing headache which occurs in nervous, hysterical women, especially at th menstrual period, and when the flow is too frequent and too profuse, or which occurs at the change of life. It is, indeed, one of the most useful remedies for many of the distressing symptoms which arise at the change of life. In these it is well, however, to combine it with small doses of tincture of gelseminum.

Actæa is said to be effective in the pleurodynia dependent on uterine derangements, one among the many troublesome complaints due to this condition.

Sir J. Simpson stated that actæa was highly beneficial in the case of women who, during pregnancy and after confinement, occasionally suffer from great mental disturbance, sometimes amounting to madness.

Actæa has been recommended in the headache arising from overstudy or excessive fatigue.

Cimicifuga seems to deteriorate on keeping, and perhaps this may explain the discrepancies in the results obtained by different observers. The reason for the deterioration may be the escape of a volatile oil present in the rhizome (Wood); on this assumption the oil would be the active principle. In addition there are present in the tissues of the plant resin and tannic and gallic acids (Bartholow).

ACONITE

Aconite is used externally to relieve pain, either in the form of liniment or ointment; the latter preparation is made from the alkaloid. In the neuralgias, especially of the brow or face, these applications are often of the greatest use, in relieving the distressing pain, either permanently, or at all events temporarily. Aconite is decidedly more useful in facial than in other forms of neuralgia, although in facial neuralgia it not seldom fails, and notably in those severer forms termed epileptiform.

We are unable as yet to predict, with any certainty, the cases in which aconite will succeed or fail; this much, however, is clear, that neuralgias depending on diseased bone, or on tumours pressing on nerves, are beyond the control of aconite: these, however, are not the only forms of neuralgia which will not yield to aconite. Facial neuralgia due to decayed teeth is often obstinate, yet these cases frequently yield to the external application of strong aconite preparations. Sometimes the case may require the assiduous application of the aconite preparation during three or four days, but sometimes, in neuralgia due to this cause, the aconite quickly loses its effect, and the pain returns in its former frequency and severity.

As no harm can follow the employment of aconite externally, it should always be tried, and if unsuccessful, recourse can then be had to other modes of treatment. If aconite will succeed at all, it will *generally* succeed at once; hence, if relief does not come speedily, it is as a rule useless to continue it. The exception to this has just been stated. The preparation should be sufficiently strong to produce decided numbness and tingling of the skin.

A piece of the ointment, the size of a bean or nut, should be applied with friction; this latter enhances its efficacy. The same quantity should be repeated until a sensation of tingling is induced. The liniment, applied with a brush, may be mixed with one-half the quantity of chloroform liniment to assist absorption.

In cases where many branches of the fifth are affected, it is often sufficient to apply the aconite over the seat of the most intense pain; and again, in cases where other nerves, like the great occipital and auricular nerves, are likewise involved, the application of the aconite, though limited to the branches of the fifth most severely attacked will often give complete relief throughout the whole area of pain.

Among the various forms of neuralgia we meet with cases of which the following may be taken as a type:—A woman suffers from severe migraine, preceded by general *malaise*, and a dark discoloration around the eyes. The pain affects, perhaps, only a small branch of the fifth, not uncommonly that twig situated near the outer canthus of the eye, and when this happens, a neighbouring vein often becomes greatly swollen. The pain lasts with great severity a variable time, extending even to one, two, or three days, and is accompanied by more or less severe vomiting, the rejected matter being, perhaps, intensely acid. As the pain declines, the patient feels other severe shooting pains, passing up the back of the neck and head behind the ear, a sure indication of the approaching decline of the attack; these secondary pains last three or four hours, then cease, leaving the patient limp and weak. The application of aconite ointment, or aconite liniment, at the very beginning of the attack, over the affected branch of the fifth nerve, will cut short the pain, prevent the sickness, and the occurrence of the secondary pains in the back of the neck and head. In some cases, however, veratria succeeds better than aconitia ointment.

When the auriculo-temporal nerve is affected, the salivary secretion may be increased, diminished, or altered in character, and the secretion of tears may be modified in the same manner when certain branches of the supra-orbital nerve are affected. The aconite application, by removing pain, will restore these secretions to their natural state.

Spinal irritation, and intercostal neuralgia, and sciatica yield, in some instances, to aconite ointment, but spinal irritation and intercostal neuralgia give way more readily to belladonna preparations.

While using these powerful poisonous applications, care should be taken not to rub them into wounds or cracks of the skin, an avoid contact with the more absorbent tissues, such as the mucous membranes, *e.g.* the conjunctiva.

Given internally, aconite at first induces a sensation of warmth at the pit of the stomach, and sometimes of nausea and vomiting. The sensation of warmth spreads over the body, and tingling of the lips, tongue and adjoining parts is soon perceived; the uvula and the tongue feel as if swollen and too large, and deglutition is frequent. A large dose induces tingling and numbness at the tips of the fingers, thence spreading over the whole body, accompanied by diminished sensibility, and some muscular weakness, which, with a very large dose, becomes extreme, and is one of the most prominent and important symptoms of the drug.

During the administration of aconite, cutting pains in the joints and other parts of the body are often complained of; sometimes an eruption of itching vesicles breaks out on the skin. Delirium occurs in some cases, but after fatal doses the mind often remains clear to the last. The muscular weakness may be extreme, and frequent faintings occur. Blindness, deafness, and loss of speech have occurred in some fatal cases.

The action of aconite on the circulation and respiration is most noteworthy. Moderate doses reduce greatly the number of the heart's beats, even to 40 or 36 in the minute, but after a larger and dangerous dose, the pulse beats faster, and it may then become irregular; sometimes even a small dose excites irregular heart action. Whether increased or lessened in frequency, the pulse always loses strength, whereby retardation of the circulation necessarily results. Dr. Achscharumow has shown that aconite paralyzes the heart of frogs, arresting it in the diastole. The effects on respiration are very similar: moderate doses render the breathing slower, but a large and poisonous quantity often makes it short and hurried.

How does aconite affect the heart? It certainly affects either the muscular substance, or the contained ganglia of the heart. On this point all observers are agreed, for aconitia affects the heart after section of the pneumogastric, or the administration of atropia, both of which acts paralyze this nerve; it also affects the extirpated heart in the same way as it affects the organ *in situ*. It is maintained, however, that it acts also through the pneumogastric, Boehm and Wartmann believing that it paralyzes the terminations of this nerve, whilst Achscharumow holds that it first stimulates the inhibitory centre of the pneumogastric, and so slows the heart, and that then the pneumogastric becomes exhausted, and at last paralyzed, and the heart beats quickly and irregularly. The former statements do not exclude the possibility of the latter as part effects.

The heart muscle appears to be directly affected, for after death it fails to respond to galvanic stimulation.

From our experiments, Dr. Murrell and I are led to conclude that aconitia paralyzes all tissues, and we suggest, therefore, that aconite affects all the structures of the heart, first its ganglia, next its nerves, and last its muscular substance.

So far as we may draw a conclusion from the scanty experimental evidence on the subject, it would appear that aconite does not affect the vaso-motor centre or the vaso-motor nerves, and therefore that the lessened arterial pressure induced is due to the depressant action upon the heart alone.

It is generally held that aconite affects respiration by its influence on the respiratory centres.

The views concerning its action on the nervous system are very diverse. Achscharumow concludes that it paralyzes both the trunk and the terminations of the cerebro-spinal motor nerves, but that it leaves the muscles unaffected.

Boehm and Wartmann conclude, from their experiments, that aconitia paralyzes first the sensory, and then the motor part of the cord.

Liegeois and Hottot believe that it first paralyzes the "perceptive centres," above the spinal cord, afterwards the terminations of the sensory nerves, and lastly, the trunks of the same.

From experiments detailed in the *Journal of Physiology*, 1878, I conclude that aconitia is a protoplasmic poison, which destroys the functions of all nitrogenous tissues, first, of the central nervous system, next, of the nerves, and last, of the muscles; but it has an especial affinity for the sensory apparatus, paralyzing therefore first the sensori-perceptive centres. Aconite, like tartar-emetic and potash salts, is a powerful depressant, and it is suggested also that these drugs severally do not depress merely through their paralyzing effect on the heart, but that they depress also by their poisonous action on the central nervous system, and on the motor nerves and muscles.

Inasmuch as aconite diminishes sensibility, it has been used internally in various painful diseases, but for the relief of pain other internal remedies have for the most part superseded it.

The power of aconite to control inflammation and to subdue the accompanying fever is remarkable. It will sometimes cut short an inflammation, and though it will not remove the products of inflammation, yet, by controlling the inflammation itself, aconite will prevent the formation of these products and so save the tissues from further injury. It is therefore most conspicuously serviceable in the early stages of inflammation, but even in the later stages when the disease has proceeded to further lengths, and has injured the organs implicated by the formation of new and diseased products, yet so long as the inflammation is still going on, aconite will do good. The beneficial effects of the drug are often visibly apparent in such superficial inflammations as pharyngitis, tonsilitis, etc.

The results of aconite are most apparent when the inflammation is not extensive, or not very severe, as in the catarrhs of children, in tonsilitis, in acute sore-throat. In these comparatively mild diseases, especially if the aconite is given at the earliest stage, when the chill is still on the patient, the dry, hot, and burning skin becomes in a few hours comfortably moist, and then in a little while it is bathed in profuse perspiration, often to such an extent that drops of sweat run down the face and chest. With the sweating comes speedy relief from many of the distressing sensations, such as restlessness, chilliness, heat and dryness of the skin, aching pains and stiffness; the quickened pulse becomes simultaneously far less frequent, and within a period varying from twenty-four to forty-eight hours both the pulse and temperature reach their natural state. If caught at the commencement, a quinsy or sore-throat rarely fails to succumb in from twenty-four to forty-eight hours. After the decline of the fever, sweating, on slight provocation, may to the annoyance of the patient continue for a few days.

If administered early enough, the beneficial effects of the drug soon become strikingly apparent. Thus in quinsy, large, livid-red, glazed, and dry tonsils will in twenty-four hours present the aspect indicative of the subsidence of the acute stage of the inflammation, the swelling and redness subsiding, whilst the membrane at the same time becomes moist, and bathed with mucus or pus. At this stage some strong astringent such as glycerine of tannin, or nitrate of silver, will remove most of the residual morbid appearances, and the pain also, should any still remain. To those who may not have tried it, these visible effects of aconite on inflamed tonsils, etc., may seem exaggerations, but any one who will employ aconite in the way described later on (p. 472) can verify the statement.

In catarrhal croup, or, as it is sometimes termed, spasmodic laryngitis, an hereditary disease, often traceable through several generations, and tending to leave the child when it is about eight years old, its effects are just as conspicuous. It removes the urgent dyspnœa within a few hours, and shortly afterwards subdues the fever, and thus it may almost extinguish in a few hours an attack which otherwise was wont to last three or four days. When there is little or no fever, it apparently checks the spasmodic and croupy breathing, as it does also in those rarer cases where these symptoms outlast the subsidence of the fever.

Aconite is equally serviceable in severe colds, accompanied by much chilliness, great aching of the limbs, a hot, dry skin, and a quick pulse.

Aconite will often be found of great service in an attack of asthma, presenting the following symptoms:—The patient, generally a child, is first seized with coryza, accompanied, perhaps, by repeated and severe sneezing, whereupon the inflammation passes down to the lungs, causing, perhaps, sore-throat before the bronchial tubes are reached. The coryza may precede the bronchial symptoms by three or four days, ceasing when the chest symptoms begin, which latter, in the early attacks, may consist only of cough with wheezing, and some shortness of breath, causing at times an inability to lie down flat at night. As the disease advances the asthmatic character becomes more developed, and the coryzal symptoms will then often decline simultaneously, until at last a well-marked bronchial asthma is established, the attacks of which run their course without any preliminary coryza; in other cases the coryzal and asthmatic symptoms of an attack may begin simultaneously. I believe that in the case of children asthma often begins in this way, and that throughout life the affection may retain more or less of its coryzal character. During the coryzal stage there is decided fever, and it is at this stage that aconite proves itself so serviceable, for given at the onset of the fever aconite cuts this short, arresting the inflammation before it reaches the chest, and in this way averting the asthma. In other cases of asthma, though there may be no coryza, the attack will be ushered in by chilliness and fever, which symptoms may precede by some days the tightness of breathing; here also aconite, given at the very commencement of the fever, may avert the attack of asthma.

In a variety of the above-described disease, of which the following account may be taken as a type, aconite is likewise beneficial:—A patient is very prone to catch cold on the slightest exposure to a draught or to damp cold. The symptoms always follow a definite order: the throat, first attacked, becomes sore, swollen, red, and beefy-looking, and this condition may involve the soft palate, its arches, and the uvula. The inflammation in a very variable time, sometimes almost at once, oftener after three, four, or five days, spreads upwards to the nose, causing coryza, and downwards to the chest, producing catarrh and cough. Sometimes the disease tends to pass upwards into the head, sometimes downwards into the chest. In bad cases, or in cases that have lasted some time—for the affection may harass a patient for years—the aspect of the throat never becomes natural, the mucous membrane always remaining swollen, red, and beefy-looking. Exposure to cold or damp intensifies this condition, which may then invade the nose and chest. This condition, if left unchecked, will finally induce emphysema, towards middle age, as a result of the repeated attacks of pulmonary catarrh. In the throat stage of these attacks there is often fever, and aconite with belladonna given at the very onset of the attack will often summarily cut it short and prevent the coryzal and lung symptoms. Applications to the throat are very useful in this troublesome and pertinacious affection, and amongst other methods of treatment it is a good plan to "harden" the throat so as to diminish its tendency to catarrh, by the nightly use externally of the cold wet compress, and internally, by the daily swabbing out of the throat with an astringent such as glycerine of tannin. In these cases also I have found the Turkish bath useful, and likewise the inhalation of sulphurous and of carbolic acids.

In pneumonia, pleurisy, and the graver inflammations, the effects of this valuable drug, though not so rapidly established, are often manifest.

In pericarditis, accompanied by violent throbbing and extreme pain, aconite will speedily quiet the excessive action, and so relieve the pain.

Most observers ascribe its influence on inflammation to its action upon the heart, and they point out, truly enough, that it is most useful in the sthenic forms of disease, and, indeed, that it may do harm unless care is taken when there is great weakness, and a feebly-beating heart.[1]

The method of employing the drug has much to do with its efficacy. It should be given, as already stated, without delay, at the very onset of the disease, at this stage every hour being important. Half a drop or a drop of the tincture in a teaspoonful of water should be given every ten minutes or quarter of an hour for two hours and afterwards hourly; but if there is much prostration, with feeble and weak pulse, a still smaller dose should be administered. Now and then a patient will experience nausea and even sickness after each dose.

We feel constrained to point out here the signal service rendered by the thermometer in enabling us to decide whether or not to give aconite. Indeed, in the treatment of inflammations, the thermometer and aconite should go hand-in-hand. If the symptoms and physical signs are not sufficiently developed to enable us to decide whether or not an acute inflammation of some deep-seated part has set in, the thermometer will often clear up the doubt. No acute inflammation can exist without preternatural heat. Hence, in a doubtful case, if the temperature after careful investigation is found to be natural, the case is not one for aconite; while, on the other hand, if the other symptoms indicate but doubtfully the presence of inflammation, a rise in the thermometer will add considerably to its probability, and will indicate the advisability of employing aconite. Sometimes the throat may be swollen, and very red, and present the appearance of an ordinary febrile sore-throat, yet fever is absent. Without the thermometer we are unable to discriminate with certainty between these two kinds of inflamed throat, and the inability to distinguish the one from the other has often led, no doubt, to the mistaken use of aconite, with discredit to this valuable drug. The non-febrile form is affected very little, if at all, by aconite.

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[1] As tending to support the view that aconite weakens the heart's contractions, it must be admitted that sometimes even small doses will, after a time, make the pulse unsteady and even irregular.

I would suggest, however, whether with careful administration the slowing effect of aconite which then results may not be useful by increasing the heart's period of rest and nutrition. The diastole of the heart occupies nineteen out of the twenty-four hours, and it is the period of rest and nutrition. When the heart is made to beat more quickly, the acceleration takes place at the expense of the diastole, and thus the recuperative period is shortened. By slowing the heart, aconite will prolong the diastole, and thus increase the time for the heart's rest and nutrition, and indirectly this retardation will tend to increase the cardiac vigour. Accordingly, whilst the direct effect of the drug may be wholly depressant to the heart muscle, the indirect effect may be in the opposite sense, and hence as one or other predominates we shall obtain opposite results.

Again, the use of the thermometer after scarlet fever is very important, for, as is well known, a patient is then liable to acute inflammation of the kidneys, the first onset of which may be at once indicated by a rise in the body temperature. It is well, therefore, during the convalescent stage, to direct the nurse to take the temperature night and morning, and if this should rise beyond the healthy standard, she should at once give aconite, so as not to allow some hours to elapse before the patient can be visited by the medical attendant.[1] The fever, it is true, may depend on some other cause than inflammation of the kidneys, but even then it will probably be inflammatory in character, and in any case aconite is indicated.

Aconite does not shorten the fever of acute specific diseases, such as scarlet fever, measles, etc., but it has a beneficial influence on these diseases, soothing the nervous system and favouring sleep by inducing free perspiration. Whether it can lessen the severity of the fever, or diminish the duration of the acute specific, is doubtful, but there is no doubt that it can control the inflammatory affections which often accompany them, and which by their severity may endanger life. Thus aconite will moderate, though it can neither prevent nor shorten, the course of the throat inflammation of scarlet fever or the catarrh and bronchitis of measles; by moderating the local inflammation it may lessen the height of the fever.

Aconite proves useless in certain epidemics of febrile inflammatory sore-throat. These cases are met with chiefly during the prevalence of scarlet fever. The throat is much swollen, of a very dusky red colour, and the pulse is very frequent and very weak. There is great prostration, and the symptoms are of a marked typhoid character. Here stimulants, with the local application of a strong solution of nitrate of silver, do most good.

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[1] Dr. Mahomed drew attention some years ago to an increase in vascular tension as preceding the appearance of albumen in the urine in post scarlatinal nephritis; if this be so [illegible] to see an additional fitness in the early administr[illegible] [illegible]ugh it may render the pulse fuller and [illegible] at any rate *raised* blood tension. Dr. [illegible] the almost universal forerunn[illegible] [illegible]ephritis, and his remedy wa[illegible] [illegible]

The thermometer renders notable service whilst giving aconite in the acute specific fevers and in certain cases of inflammatory sore-throat. For though under the influence of this drug the skin may have become moist and the pulse have fallen perhaps to its normal state, and we might from these effects have been led to conclude that the temperature likewise had become natural, the thermometer will show that it has remained unaltered, and in this way both diagnosis and prognosis will be helped.

Aconite is sometimes of service in erysipelas. Administered at the commencement, it often cuts short the attack at once, and even when in spite of it the disease continues, aconite will reduce the swelling and hardness, lessen the redness, and prevent the inflammation from spreading.

Occasionally in children after vaccination, perhaps when the spots have nearly healed, an erysipelatous redness may appear, spreading over the arm and a great part of the trunk, ceasing usually in one part, and then successively attacking contiguous parts, and leaving a yellow discoloration and desquamation. The redness in this affection is often intense, the tissues being very hard, painful, and shiny, and the inflammation may continue for weeks. It may run down the arm, involve the hand, and implicate the greater part of the chest, or it may appear in the leg and gradually spread to the foot, or, again, it may spread from the hand up the arm, and once more down to the hand, and this may be repeated many times. Sometimes the inflammation terminates in small abscesses. In cases such as these, aconite will generally arrest the inflammation at once, and even when it fails to do this it will render the redness less intense, and the swelling less hard and painful. The troublesome inflammation often arising after the vaccination of adults, yields ordinarily to aconite, especially if it be supplemented by the local application of belladonna ointment twice daily.

Eminent authorities speak highly of aconite in the treatment of acute rheumatism, but its good effects are not so apparent as in acute inflammation. Acute rheumatism, having no regular course or duration, may last, untreated, only a few days, or may endure for many months. It is difficult, therefore, to decide whether, in certain cases, the speedy decline of the fever is a natural decline, or due to the aconite. It is certainly ineffectual in many cases, these appearing to run their course uninfluenced by the drug, and therefore if useful in others it is still undetermined in what class of case it will be found useful, in what other class of case it will prove useless. It often appears to be of service, however, in subduing the pain of inflamed and swollen joints.

Gouty pains are said to yield to this remedy.

It has also been given internally in neuralgia, and apparently with good results. Gubler, indeed, maintains that aconitia is highly useful in trifacial neuralgia, and that it cures the most unpromising cases. He insists on its being given in solution, and begins with $\frac{1}{140}$th grain of the nitrate, increasing the dose till $\frac{1}{10}$th grain is reached. This treatment is contra-indicated if the patient suffers from heart disease. Seguin confirms this statement, but points out that susceptibility to the drug is greater in some persons than in others. He finds that as a rule distinct physiological effects follow $\frac{1}{100}$th grain thrice daily. Wood states that $\frac{1}{4}$ milligramme, *i.e.* about $\frac{1}{240}$th grain, has caused serious symptoms. The dosage therefore should scarcely exceed this as the lower limit. Yeo recommends that $\frac{1}{250}$th grain of Duquesnil's crystallized aconitine should be the lower dose, this being pushed cautiously till slight numbness or tingling of the face and lips has been produced.

It has been elsewhere shown that aconite lessens the rapidity of the circulation. It may, therefore, be used in all cases where it is needful to subdue vascular excitement; in fact, it may be given in precisely those cases which were formerly treated by bleeding.

In sudden checking of the menses, as from cold, aconite will often restore the flux, and thus obviate the distressing and peculiar train of symptoms produced by arrested menstruation.

Small doses of aconite, administered frequently, will often check speedily the nose-bleeding of children and of plethoric people.

Aconite will usually subdue the "fluttering of the heart" of nervous persons, and also nervous palpitations. More general treatment is often required, but when the conditions causing the disturbance are undetectable or irremovable, then aconite may be usefully employed.

In several cases I have seen aconite quiet the distressing restlessness of "fidgets," which affects men as well as women, and I have known a few drops at bedtime calm the patient and give sound, refreshing sleep; if given one drop at a time, the dose may be repeated hourly for three or four times.

A drop of tincture of aconite each hour yields satisfactory results in the acute stage of gonorrhœa; it is said also to remove chordee.

It has been recommended in otitis, and is said to relieve the pain quickly.

DIGITALIS AND ITS PREPARATIONS

LARGE doses of digitalis excite nausea, vomiting, and diarrhœa; the matters voided, either from the stomach or bowels, are of a grass-green colour, due perhaps to the action of the gastric juice on some constituent of the digitalis. These results may follow even a medicinal dose.

The active principles pass readily unchanged from the intestines into the blood, for the same symptoms ensue whether the drug is swallowed or is injected into the veins. The active principles are glucosides.

The action of digitalis on the circulation is very noteworthy, and our knowledge of its influence on the heart and vessels, whether healthy or diseased, is becoming daily more exact.

A large class of substances, namely, sodium hydrate, potassium hydrate, ammonium hydrate, the carbonates and bicarbonates of these elements, barium salts, strontium salts, digitalin, antiarin, helleborein, digitoxin, strophanthin, apocynein, scillaïn, adonidin, oleandrin, digitaleïn, convallamarin, spartein, tanghinia, upas, erythrophlein, etc., affect the frog's heart much in the same way, and perhaps it is fair to conclude that they act similarly on the mammalian heart.

When administered through the circulation, or especially applied to the exposed heart, they all induce persistent contraction of the ventricle. In consequence of this so-called persistent spasm, contracture or tonicity, the ventricle expands less during dilatation and its capacity is reduced; at the same time the systole becomes more powerful and complete. Along with this persistent contraction then the rhythmic contractions also continue, but since, owing to lessening of diastolic dilatation, the capacity of the ventricle is diminished, less blood will be propelled with each systole.[1]

The amount of persistent contraction is in proportion to the dose of the drug, and with large quantities the persistent contraction may be sufficient to contract the ventricle completely, and then in default of dilatation, of course, rhythmic action ceases. But rhythmic tendency or potential is not destroyed, for if the ventricle be dilated by increasing the internal pressure rhythmic action is again restored.

All the agents above enumerated affect the muscular substance of the ventricle directly, *i.e.* by direct contact, for if topically applied to a portion only of the ventricle they induce a persistent contraction in that part, so that it dilates in a less degree than the rest of the ventricle; if the application is strong enough, the part experimented on may remain persistently and fully contracted, whilst the rest of the ventricle dilates fully.

Digitalis with several other substances, and perhaps all those named in the foregoing paragraph, induce sometimes irregular action of the ventricle. This irregularity, as seen in the frog's ventricle, manifests itself by one or more portions of the ventricle becoming rigid, white, and contracted, while the remainder of the organ continues to dilate regularly. When the yielding portions are small, a peculiar appearance, as if the wall of the ventricle formed crimson pouches or protrusions, is produced. This irregular action is due to some parts of the ventricle being more influenced by the digitalis than the rest, and these affected parts becoming persistently contracted, dilate less in diastole than the neighbouring portions affected in lesser degree.

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[1] This applies of course to the healthy heart; in the case of the diseased and dilated heart, which is failing to propel a proper quantity of blood, we shall see that both by contracting the heart persistently, and by enforcing the rhythmic pulsations, digitalis will *increase* the quantity of blood propelled at each beat.

Digitalis increases the force of the heart's contractions, and at first reduces the number of the beats; later, after large doses, the beats become frequent, feeble, and irregular.

The following experiment may be quoted here :—The isolated heart of a frog was made to pump serum through a glass tube; on now applying digitalis the heart acted with greater force, but further larger doses diminished the ventricular action. Finally the heart stopped in full systole, every drop of serum squeezed out of the ventricles. Each individual beat of the heart was greatly increased in strength by the first applications, in some instances nearly doubled. The loss of power after the larger doses appeared to be due partly to the great retardation of the heart, partly to the incompleteness of the diastole, and the consequent imperfect filling of the ventricles (Boehm).

Messrs. Bouley and Reynal, giving large toxic doses of digitalis to horses, found that the circulation became more rapid, the heart-beats more abrupt, their energy much increased. After a certain time, a vibratory thrill, accompanied by a decided metallic tinkling, attended the ventricular contraction and, as poisoning went on, a distinct bellows' murmur was heard, becoming more audible on exertion; the heart-beats then showed a decided intermittence, and the pulse was small, thready, and intermittent.

In doses smaller but still toxic, there was, at first sight, excitement of the heart, with some quickening of its beats; they then soon grew less frequent, and fell to 25 or 20 in the minute. The cardiac sounds were more clearly heard, more distinct from each other than normally, and of a different rhythm, there being occasional intermissions occurring regularly or irregularly; after a time a vibratory thrill was detected, followed by a bellows' murmur. As death approached, the beats became rapid, 90, 100, or 140 per minute. Dr. Brunton, who has heard the blowing murmur several times, says it occurs in horses, dogs, and in the human subject, and that it is probably due to mitral or tricuspid regurgitation, due to irregular contraction of the columnæ carneæ.

Digitalis also heightens greatly the arterial tension.

Digitalis slows the pulse by stimulating the vagus nucleus, and the terminal branchings of the vagus in the heart, for Boehm finds that after giving digitalis a faradic current applied to the vagus causes a greater effect than before the administration of it. On the other hand the rapid action of the heart after large doses of digitalis is due to paralysis of the ends of the vagus, this condition supervening upon the stimulation.

The greatly increased arterial tension depends partly on the increased force of the heart's contractions, but chiefly, as first pointed out by Brunton, on contraction of the arterioles.

Traube and Boehm's experiments would seem to indicate that digitalis acts only through the vaso-motor centre; I venture, however, to suggest that digitalis acts directly on the muscular tissue of the arterioles.

In evidence the following may be advanced:—

I. We have seen that digitalis (in common with the group of substances I have enumerated) undoubtedly does affect directly, *i.e.* immediately, the muscular tissue of the heart, inducing persistent contraction. Inasmuch then as this action on the heart is independent of the agency of nervous tissues, it seems presumable that it may affect other muscular tissue in the same way.

II. Drs. Donaldson and Stevens in America, and Dr. Sainsbury and myself experimenting simultaneously, employed the same method, and we found that digitalis does undoubtedly cause strong contraction of the blood-vessels when these are quite cut off from the central nervous control. Hence digitalis must act either directly on the muscular tissue of the walls of the blood-vessels, or on some peripheral nervous apparatus which governs the muscular tissue of the blood-vessels: in either case the action would be peripheral.

In the case of a poisonous dose of digitalis the stimulant action upon the arterioles fails after a time and gives way to paralysis, the vessels therefore dilate, and the arterial tension falls.

In the therapeutic use of digitalis we can conceive that it may afford relief in one or more of the five following ways:—

(*a*) By strengthening the action of a weak heart.

(*b*) By reducing the strength of the beats of a heart acting too powerfully.

(*c*) By lessening the frequency of the heart's beats.

(*d*) By correcting irregular action of the heart.

(*e*) By increasing tonicity and so lessening the size of the cavities of the heart, thereby obviating the condition of over-distension in which the stretched ventricles are unable to contract upon their contents, a condition threatening complete asystole.[1]

Digitalis is of especial service in mitral disease.

It will often be found of eminent service to a patient presenting the following symptoms and physical signs:—There is dropsy, which may be extensive; dyspnœa more or less marked, a breathing which, in the earlier stages of the condition, is much distressed periodically, and especially at night, but which, when the disease reaches its worst stage, is continuously bad, although it becomes paroxysmally worse: in this stage the patient cannot lie down in bed, and may be obliged to sit in a chair, with the head either thrown back or more rarely leaning forwards resting on some support. The jugular veins are distended, the face is dusky and livid, and the pulse very frequent, feeble, fluttering, and irregular. The urine is very scanty, high-coloured, and deposits copiously on cooling. The heart is seen and felt to beat over too extensive an area, and the chief impulse is sometimes at one spot of the chest, and sometimes at another. The impulse is undulating, and the beating very irregular and intermittent. As a rule a murmur is heard, having the character of that produced by mitral regurgitant disease.

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[1] The more ordinary uses of digitalis will be by (*a*), (*c*), (*d*), or (*e*); to effect reduction of the force of the heart (*b*), a different and fuller dosage would probably be required.

Here obstruction to the onward passage of the blood has occurred owing to the disease of the mitral valve, and hence have arisen congestion of the lungs, distension of the right ventricle, tricuspid regurgitation, and general venous distension. In fact, there has occurred heightened venous tension, with corresponding diminished arterial tension, the latter causing diminished pressure in the renal glomeruli, and a slower circulation through the kidney, whence the diminished excretion of urine, and the hydræmia. The watery blood state, helped by the heightened venous tension which on account of gravitation is most marked in the dependent parts of the body, will have induced dropsy.

A case presenting these symptoms and physical signs will generally respond quickly and favourably to digitalis.

The effects on the pulse, the urine, and the dropsy, are to be carefully watched. When the drug is properly administered, the pulse grows considerably stronger, more regular, and much slower, till in very many cases all irregularity ceases, and the beats become natural in frequency and rhythm, with much increase of tension. At the same time the urine, which previously may not have amounted to more than half a pint in the twenty-four hours, increases to one, two, four, or even eight pints a day, and in proportion to this increased flow the dropsy diminishes till it finally disappears. Should at any time during the administration of digitalis, the urine fall considerably below the normal, this must be taken as a danger signal and the indication to reduce the dose or temporarily suspend it (Balfour).

Now this obstruction to the circulation with the above symptoms may be due either to mitral regurgitation or to mitral obstruction, or to both combined. Some observers, however, consider that digitalis is beneficial in mitral obstruction, while others hold that it is indicated more especially in mitral regurgitation. I am satisfied I have seen it of eminent service in cases where, after death, the symptoms were seen to be due to mitral regurgitation, and but little, if at all, to mitral obstruction.

How then does digitalis lessen the back flow of blood from the ventricle to the auricle in mitral regurgitation? The mitral valves are insufficient to close the mitral orifice unless the ventricle contracts strongly, and hence, if the ventricle from weakness or from containing more blood than it can propel contracts imperfectly, mitral regurgitation will increase in proportion to the increased insufficiency of the less approximated valves. Digitalis therefore may act in two ways: in the first place, by increasing the amount of contraction at each beat, it will approximate the points of attachment of the segments of the valve, and so permit of a more complete closure of the damaged valve; secondly, by increasing the tonicity of the heart muscle, and so lessening the size of the ventricular cavities, it will constrict the mitral orifice and lessen regurgitation; this latter action being more persistent maintains the heart at a level of contractility nearer the normal. I suggest, however, that a third explanation is possible. In mitral disease manifesting the symptoms previously described, the heart generally acts irregularly. It may be assumed, in these cases, that the columnæ carneæ do not act harmoniously with the walls of the ventricle, and that hence, owing to this want of co-ordination, the closure of the mitral valve is incomplete, and regurgitation is increased. In such cases digitalis, by obviating the irregular action of the heart and co-ordinating its various parts, will remove the dynamic regurgitation due to irregular action. In favour of this view is the fact that digitalis is especially indicated when the heart's action is irregular, and it is, in my experience, much less serviceable in those cases of mitral disease where the heart acts regularly.

By those who believe that digitalis is useful in mitral stenosis, the following explanations are given. The auricle empties itself into the ventricle chiefly during diastole, and consequently the longer the diastolic pause the greater the time for the blood to flow into the ventricle. Digitalis by slowing the heart's action prolongs each diastole, and in this way permits the auricle to become more completely emptied during each cardiac cycle, thus partially overcoming the effects of mitral obstruction, particularly in those cases where the heart is contracting too frequently. Further, in cases of mitral stenosis, digitalis may conceivably act by increasing the force of the auricular contraction, and by increasing the tonicity of the auricle, thus lessening its capacity, and so reducing the quantity of blood the auricle has to propel at each contraction. It will, however, be obvious that, the auricular walls being very thin in comparison with the ventricular, the effect of stimulation of the auricular muscle will be less in proportion, and very possibly will be quite insignificant. Indeed, the prevailing view now is that the drug is *relatively* inefficient in mitral obstruction, and there is probably a good deal of truth in the working rule which Whitla lays down thus:—"In proportion to the extent of the obstructive lesion, so will the effect of digitalis be disappointing; and conversely, the more regurgitation taking place, the more improvement may be expected from digitalis." This rule has the further merit that it implies that we should *try* digitalis in every mitral case, indeed, even in cases of pure mitral stenosis.

As I have said, digitalis acts best when the heart beats irregularly, and, indeed, an irregularly acting heart is generally an indication for digitalis; certainly it is so when the irregularity is associated with mitral disease. Irregularity, however, may be due to fatty degeneration, or it may occur in aortic disease with deficient compensation; in the former of these cases I find digitalis inefficient, either in removing the irregularity or in obviating other symptoms, and in the latter the indications for digitalis are less conspicuous than in the purely mitral cases, though in failing heart from aortic disease the drug may render excellent service (Balfour).

In treating mitral diseases we may use the infusion, the tincture, or the powder of digitalis; all are serviceable, but I have seen cases where the infusion has succeeded after the tincture has failed. In respect of dose, it is best to begin with a moderate dose, say a drachm of the infusion or three to five minims of tincture, three or four times a day, for patients differ considerably in their susceptibility to digitalis, and too large a dose may cause sometimes much distress, and aggravate the troubles of the patient. The foregoing doses failing, the dose, of course, must be increased, but in most cases the large doses of fifteen to twenty minims of the tincture, such as are often given, will be found quite unnecessary. Sometimes the patient cannot exist without digitalis, for, on discontinuing it, the heart troubles return, and he may accordingly be constrained to continue taking it for months or years, with, perhaps, short intermissions from time to time.

Many authorities maintain that digitalis is harmful in aortic disease with deficient compensation.[1] In the case of aortic regurgitation, with failing compensation, digitalis, unless given guardedly, does undoubtedly in some cases increase the distress of the patient. This bad effect is explained in the following ways:—Digitalis, as we have seen, slows the heart, and thereby increases the length of each diastole, and so prolongs the period during which blood can flow back from the aorta into the ventricle; hence regurgitation is favoured, and hence there is an increase of cardiac distress. Further, it is pointed out that digitalis heightens arterial tension, which also will increase the rate of flow of the blood back from the aorta into the ventricle. On these grounds some writers advise that in cases of aortic regurgitation, where some of the symptoms may indicate digitalis, the drug should be given in doses inadequate to slow the heart's action (Foster).

On the other hand, Dr. Balfour, a great authority on such points, speaks very highly of the effect of large doses of digitalis in aortic regurgitation with deficient compensation. He gives it moreover in very large doses, of course watching its action very carefully, and he says he has seen very striking results. Digitalis, he thinks, acts in these cases by increasing the tonicity of the heart, whereby the size of the dilated left ventricle is lessened, and the paralyzing effects of dilatation obviated.

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[1] So long, of course, as compensation is equal to the valvular defect; whatever its nature, digitalis and other drugs are needless.

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Many writers ascribe the good effects of digitalis in mitral disease to its simple stimulant action on the heart, meaning thereby that digitalis strengthens the contractions and thus assists in overcoming the effects of deficient compensation, and enables the heart to meet the valvular defect. This view has led to the employment of digitalis in aortic obstruction with deficient compensation, as well as the other forms of heart trouble, and also in pulmonary obstruction from emphysema, etc., which have induced distension of the right cavities of the heart. In such cases I have failed to obtain, I think, any good, and certainly the results are far less satisfactory than in cases of mitral disease; this is admitted by those even who are most confident of the usefulness of digitalis in aortic obstruction and in emphysema with bronchitis.

These comparative results with digitalis would suggest that in mitral disease the good effects depend on some other action upon the heart than a mere tonic influence. I have already shown how by reducing the heart's frequency the effects of mitral obstruction may be met by retárdation of the heart, but, in addition to the mechanical advantages thus gained, the diminished frequency adds a physiological advantage, for since repair takes place during diastole, prolongation of the diastole must permit of greater nourishment of the cardiac structures; this should apply to all forms of cardiac failure with increased frequency.

Proceeding we meet with cases of the following kind in which digitalis is often of great service. A patient with valvular defect suffers but little, so long as he remains quiet, but from excitement, or more frequently from some strong muscular exertion, the heart becomes greatly embarrassed, and its contractions very frequent, 150 to 160 per minute, and very weak and irregular. There follows much dyspnœa, perhaps orthopnœa, with much lividity and jugular distension. In such a case mental excitement or physical exertion has accelerated the heart's action beyond the power of this organ to propel the blood through the constricted valvular orifice; blood therefore accumulates in the cavity behind, and by distending it weakens the contractions of its walls. Here, the prompt and liberal administration of digitalis will often save a patient from death: ten drops of the tincture of digitalis every hour for a few hours, and then every two hours, should be given, or a corresponding dose of infusion. In such a case, we can conceive that the digitalis increases the force of the cardiac contractions, and so enables the blood to be propelled through the constricted orifice in quantity sufficient to remove the distension of the cavities behind; or it may be that digitalis, by increasing the tonicity of the heart, and lessening the size of its cavities, so reduces the quantities contained that the chamber affected is competent to propel all its blood through the constricted orifice, and the symptoms of obstruction cease.

It is generally held that digitalis and its allies are useless in fatty heart. This is in accordance with my own experience.

In cases of the following kind, I find the digitalis group useless. A patient suffers from arterio-capillary fibrosis, inducing hypertrophy of the left ventricle. Subsequently the heart itself becomes the seat of fibroid degeneration, and the compensatory hypertrophy loses its value. Then follows the train of symptoms which attend a weak left ventricle—symptoms much like those which occur in disease of the aortic valves with deficient compensation, for indeed the conditions are much the same, the seat of obstruction being in the one case in the arteries and arterioles, in the other at the aortic valves.

Da Costa recommends digitalis strongly in the condition termed by him "irritable heart." This disease occurs frequently among soldiers, and may come on suddenly or gradually, with proneness to fatigue, palpitation, and dizziness. It is characterized by pain, generally persistent, but also liable to be paroxysmally intensified, lacerating, or more rarely burning or tearing, increased by exertion, and situated most frequently over the apex of the heart, whence sometimes it radiates in all directions, and may shoot down the left arm; it is often accompanied by a hyperæsthesia of the cardiac region, which is increased by each attack of palpitation. The latter symptom is often complained of, the palpitation varying in frequency and severity; it is liable to occur at all times of the day, and may be accompanied by much distress and pain. The palpitation is generally brought on by exertion, although it may occur while the patient is in bed. These cardiac attacks are accompanied by a dull headache, giddiness, and dimness of sight. The violent seizures may even produce insensibility. The sleep of these patients is much broken and troubled by disagreeable dreams, and the patient cannot, as a rule, lie on the left side. The pulse is rapid, varying from 100 to 140 per minute, small, compressible, and sometimes jerking, often irregular in force and rhythm—always remarkably affected by posture, being very frequent while standing, much slower while lying down; the difference may amount to thirty or forty beats per minute. Palpitation greatly increases the frequency, which in one instance rose to 192 beats per minute. The respirations are but little hurried, varying from twenty-four to thirty-four, though the patient complains of an oppressed breathing, rendered worse by an attack of palpitation. The impulse of the heart is extended, but is "quick, abrupt, or jerking," and the heart may beat irregularly. The first sound is deficient in volume, and is "feeble, or short and valvular, like the second sound." Murmurs are absent, as a rule. This condition, which is produced by over-work and fatigue, is fostered by depressing influences. It commonly leads to hypertrophy, upon which, of course, the physical signs are modified. When the heart was not hypertrophied, Da Costa found that tincture of digitalis, in ten-minim doses, thrice daily, quieted the excited organ, reduced the frequency of the pulse, and often strengthened it, and regulated the cardiac action. If much hypertrophy existed, then digitalis proved less serviceable, and sometimes failed to give any relief; in such case aconite, in three to six-minim dose, was found very useful, although in purely nervous cases it was not only useless, but often increased even the frequency of the pulse. In cases of much irritability, with slight hypertrophy, a combination of digitalis and aconite did good. Belladonna was useful in cases marked by irregularity of the pulse, but it proved of little service in other cases, modifying but slightly the frequency of the pulse. It was of no service in cases complicated with hypertrophy. Da Costa often continued the digitalis for months without producing any toxic effects. In addition to the foregoing treatment, he employed rest in the recumbent posture.

The significance of these statements as to the better prognosis in those cases where the evidence of hypertrophy is less, is probably the following:—The heart which shows hypertrophy is a heart whose damage is of longer standing, for the fact and the degree of the hypertrophy present show the fact and the degree of the response which the lesion has elicited from the heart. If now after the development of this compensatory response the signs of heart failure set in, as above described, the inference to be drawn is that the heart is at the far end, its muscle fibres worn out. Naturally such heart will respond less, or fail to respond at all, to the stimulus of digitalis, the efficacy of which must stand in direct proportion to the integrity of the tissues upon which it is brought to bear.

Digitalis is often very useful in quelling attacks of palpitation occurring in cases of pure hypertrophy of the heart, due either to valvular disease, especially of the aortic valves, or to Bright's disease, or to excessive muscular exertion. In aortic disease the hypertrophy is compensatory, hence, in most cases, in particular of aortic obstruction, no treatment is needed for the hypertrophy itself.

Sir Balthazar Foster recommends digitalis in aortic regurgitant disease when there is, as he puts it, more compensatory hypertrophy than the impediment to the circulation requires, this being indicated by violent action of the heart, bounding vibratory arteries visible over the body, an almost constant headache, flushed face, and in the ears. He points out that in these instances the acti medicine must be watched, for too large a dose may induc prostration, with aggravation of the palpitations, effects which he attributes to the slowing of the heart by digitalis, and the increase of the regurgitation at each diastole; but although this explanation may be partially, it is not wholly, true, for the same consequences follow too large a dose of digitalis in other forms of hypertrophy unassociated with valvular disease. In cases such as these, two to five minims of the tincture are often as much as can be tolerated, and for the most part they are better treated by one to three drops of tincture of aconite, given thrice daily.

I find digitalis to be of conspicuous service in cases of prostration from fever, such as typhoid fever or pneumonia. In these diseases signs of failure may show themselves first in the nervous system, but sometimes they appear earlier in the circulatory system, and even if they occur first in the nervous system the heart soon grows weak also. The signs of nervous depression are sleeplessness, and delirium with tremulousness of the hands, tongue, etc., and muscular twitchings. This condition is best treated by the early employment of some narcotic, which, by inducing sleep, prevents the occurrence of these symptoms and thus, indirectly, sustains the appetite, digestion, and assimilation, and obviates the need of cardiac tonics such as alcohol, etc. If untreated, this condition of the nervous system soon induces cardiac failure, unless as in some cases the failure have already begun in the heart. The pulse in either case becomes very frequent and feeble, or even irregular; the ears, tip of the nose, lips, and dependent parts of the body become dusky, and signs of hypostatic congestion of the lungs or of hypostatic pneumonia arise. If this condition of the heart is early treated by liberal doses of tincture of digitalis the pulse becomes greatly reduced in frequency and may speedily become normal in rate, at the same time it grows fuller and of higher tension, and, coincident with these improvements, the duskiness of the parts most distant from the heart is either prevented or removed, and the patient is carried safely through a dangerous condition. I give ten minims of the tincture of digitalis every two or three hours, according to the urgency of the case. Digitalis I find to be of much greater benefit than alcohol in such cases. I suggest that digitalis acts by slowing the heart, thus prolonging the diastolic period and giving a longer time for the nutrition of the weakened heart, and thus sustaining it.

Digitalis is, to a small extent only, a diuretic, by a direct action on the kidneys; it is for this reason useful in some cases of Bright's disease. When, however, it obviates the effects due to cardiac disease its diuretic effects are astonishing, but I find then that the diuretic action of digitalis is limited by the dropsy, and that when the dropsy disappears, the remedy no longer causes an increased secretion of urine. This also is the [illegible] diuretics.

How does d[illegible] cause so great an

increase in the quantity of urine? In the first place, it removes those kidney conditions of ill-filled arteries and over-filled veins which are secondary to the heart disease, and upon which the urinary failure to secrete depends; this done, the unburdened organ acts as in health, and secretes normally. But, in the cases now referred to, we find that the urine increases, from perhaps half a pint to three, four, or even eight pints daily. Whence this excess of urine? is it due to a further direct stimulant action of digitalis on the kidneys? Were this the true explanation, then the excessive secretion should continue so long as the digitalis was administered, but we find, as I have said, that when the dropsy has disappeared the kidneys no longer secrete in excess. The copious flow of the urine must therefore be explained by the hypothesis that digitalis, by relieving the heart, checks the conditions which produced the dropsy, whereupon the dropsical fluid quickly re-enters the circulation, and the kidneys eliminate the excessive quantity of water in the blood.

To examine further this question, as to how digitalis affects the kidneys in heart disease, and increases the secretion of the urine, we may note that:— The separation of the water of the urine is effected chiefly through the Malpighian bodies, probably by a simple act of filtration, and therefore that the amount of the secretion will depend largely on the lateral pressure in the blood-vessels of the glomeruli.

Now, section of the cord below the medulla, *i.e.*, below the vaso-motor centre, causes great dilatation of all the blood-vessels, and thus produces general lowering of the blood-pressure, including of course diminution of blood-pressure in the kidneys, and accordingly this is found to be followed by diminution, and even arrest, of the excretion of urine. Section of the renal nerves on the other hand causing wide dilatation of the renal vessels, but *no general lowering of blood-pressure*, we thus get an increased blood supply to the kidney and great increase in the urinary secretion.

But in the forms of cardiac dropsy benefited by digitalis, there is tricuspid regurgitation, with great repletion of the venous system, and corresponding emptiness of the arterial system, and thus arterial tension is greatly lessened. Some writers ascribe the diminished urinary secretion entirely to this loss of tension. True it is that the venous engorgement causes distension of some of the capillaries of the kidneys, and thus heightens their tension, and it might therefore be suggested that this increase of lateral pressure would cause an increase in the secretion of the urine. It is urged, however, against this that the venous congestion only affects the capillaries of the tubules, and does not reach the Malpighian bodies, the capillaries of the tubules preventing this, and that thus the blood-vessels of the Malpighian bodies, through which the water of the urine filters, become partially empty, their pressure greatly diminished, and the secretion of the urinary water correspondingly diminished. But is this statement true? Are the blood-vessels of the glomeruli partially empty in cases of tricuspid regurgitation and venous engorgement? To this question I should answer, certainly not, for in the post-mortems I
made these bodies have always been greatly enlarged and engorged. E
ment, however, does not mean, necessarily, [increased lateral
evidence of this we need only cite the engorgement which takes
distal branchings of a plugged artery, in embolism, in which
just cited the engorgement will be essentially venous. The

in either case will be venous rather than arterial, and the actual distension will depend largely upon a *loss of tone* in the vessels. We may take it therefore that there is an actual diminution of pressure in the glomeruli in these cases of kidney congestion from heart disease, as compared with health, and further, that the rate of circulation through the kidney will be greatly diminished by the lowered blood-pressure, and that on this account also the separation of water from the sluggish stream of blood will be lessened. Digitalis by raising the arterial pressure will remove the venous engorgement and quicken the flow of blood, and in both of these ways will establish a freer secretion of urine.

By combining mercury with digitalis we often materially increase its efficacy in the treatment of cardiac dropsy. The well-known diuretic combination of Digitalis, Blue-pill and Squill is in every hospital pharmacopœia. Another most valuable addition to the digitalis treatment of heart failure is opium. (*See* Opium as a heart tonic.)

Brunton's experiments on himself show that large doses of digitalis increase somewhat the urinary water, and to a less extent the urinary solids. He points out that in the final stages of fatal doses, the urinary secretion may be greatly diminished, or even arrested; this is due, he suggests, to a powerful contraction of the renal vessels. Mr. Rose Bradford, in his careful experiments, confirms these statements He recorded, graphically, variations in the carotid pressure and in the supply of blood to the kidney, this supply being estimated by Roys' oncometer, an instrument which records any variations in the size of an organ. Mr. Bradford finds "that digitalin administered to cats in doses of $\frac{1}{40}$th of a grain and upwards produces marked contraction of the kidney, which contraction is very persistent, lasting frequently for half an hour, and, if large and repeated doses be injected, the kidney may not recover its previous volume, even after some hours. Simultaneously with this renal constriction there is, as is well known, considerable heightening of the blood-pressure. It is interesting to observe, with regard to this drug, that although it produces contraction of the renal vessels, like the initial action of caffeine, unlike caffeine, it does not cause any diminution or arrest of the urinary secretion during this period of contraction. Instead of any diminution in the rate of urinary flow, this is on the contrary slightly increased by digitalin. The probable explanation of these differences lies in the fact that whereas caffeine and digitalin both produce contraction of the renal vessels, with caffeine the general blood-pressure is lowered at first and with digitalin it is raised. Hence, during the initial stage of the action of caffeine the rate of flow of blood through the renal vessels is lessened; whereas with digitalin this rate of flow is increased."

Digitalis has been employed in the treatment of acute inflammation. Mr. King, of Saxmundham, held that no good was to be effected in inflammation [illegible] with a large dose, and he gave as much as from [illegible] tincture; with these formidable [illegible] inflammations if they were attacked at their very commencement, therefore before the organs involved became disorganized. He would administer a dose and then wait twenty-four hours to watch its effects; at the expiration of this time, if the pulse did not become much less frequent or irregular, he would repeat the dose. He gave as much as two drachms of the tincture to a child of nine months old. Vomiting will sometimes follow quickly upon these very large doses, but no serious or dangerous symptoms, according to Mr. King, have ever followed his extensive and startling use of digitalis. Of late years this treatment has been extensively practised by Petresco in cases of pneumonia, and according to him the disease may be aborted in two or three days by the method. The pulse rate often falls to very low figures.

Dr. Royston Fairbank finds that digitalis, employed both locally and internally, is useful in inflammations. He narrates cases of acute inflammation of joints, acute inflammation of the legs from varicose ulcers, severe inflammation of the breast, erysipelas, all of which have yielded speedily to fomentations, made by infusing a small teaspoonful of the dried leaves in half a pint of boiling water, or by adding a drachm of tincture to half a pint of boiling water; the fomentations were applied by means of flannels wrung out of this infusion. Sometimes, after the use of *simple* hot fomentations, he advises the rubbing in of the tincture.

Digitalis is able to reduce the temperature of fever, though large doses are often required for this purpose.

In typhoid fever, Wunderlich recommends digitalis, asserting that in two or three days it will reduce the temperature of the body by 2° or 3° Fah., and will retard the pulse, sometimes, by thirty or forty beats in the minute. Its use as a cardiac tonic in this and other fevers with marked cardiac weakness has already been referred to.

Digitalis controls epistaxis, hæmoptysis, and menorrhagia. In cases of menorrhagia unconnected with organic disease, this medicine, independently of the state of the circulation, is said to be more efficacious than any other remedy; and, when organic disease gives rise to this form of bleeding, the effect of this drug is scarcely less manifest, although the advantage may be temporary.

The late Dr. Brinton esteemed it highly in bleeding from the lungs, stating that when it reduced the frequency of pulse, the bleeding ceased. The infusion was to be preferred for hæmorrhages; large doses might be required.

In rare instances, digitalis occasions strangury, with a desire, almost incessant, to pass water, accompanied by great and painful straining, and, in women, by strong "bearing-down" pains.

Few remedies are of more avail in arresting spermatorrhœa digitalis, in drachm or two-drachm doses of the infusion, twice or tl daily. The free application of cold water to the testicles and peri aids the effect of the medicine; and it is a useful practice to l testicles hang in cold water night and morning for five or ten minutes at a time.

The late Mr. Jones, of Jersey, excited considerable astonishment by the announcement of the good effects he obtained from very large doses of the tincture of digitalis in the treatment of delirium tremens. He gave half an ounce of the tincture, and repeated it when necessary in four hours, again in six hours, and again, when needful, in two-drachm dose. Mr. Jones says of this treatment: "The pulse, so far from being lowered in force, becomes fuller, and stronger, and more regular soon after the first dose. The cold clammy perspirations wear off and the skin becomes warmer. As soon as the remedy produces its full effect, sleep for five or six hours commonly follows. Sleep is the guide to the repetition of the dose. No action on the kidneys is evinced by an unusual secretion of urine. Sometimes the bowels are acted on slightly, but not commonly." Mr. Jones never saw any alarming symptoms follow these large doses, although he treated in this way about seventy cases of delirium tremens. It would appear that he adopted this treatment only in the severer asthenic forms of delirium tremens. With regard to this treatment of delirium tremens, the following conclusions appear to be established:—

I. That the medicine may be given in the manner directed, without danger.

II. That it very often does good, producing speedily, in most cases, refreshing, quiet sleep, and that, even when it fails to induce sleep, it generally calms undue excitement.

III. That some cases appear to be uninfluenced by the drug.

According to the last statement, it yet remains to ascertain the forms of the disease amenable to digitalis.

Under this treatment some severe asthenic cases, in which, owing to the great prostration present, death seemed imminent, have rallied astonishingly and ultimately recovered. The evidence of this is too strong to be disputed. Under the influence of digitalis, the weak, rapid, and fluttering pulse has grown strong and steady, the skin has become comfortably moist and warm, and simultaneously with the improvement in the circulation and state of the skin, the general condition of the patient has improved. On the other hand, it appears equally certain that sthenic forms of the disease are also amenable to this drug; in several instances I have seen this form of the disease yield speedily to huge doses of digitalis.

I give a short account of a [illegible] ich I treated
with large doses of tincture of [illegible] d been a
very hard drinker for many [illegible] urine
contained a considerable am [illegible] of
chloral, and bromide of potass [illegible]
quieted him for several hours, [illegible]

way benefited by our treatment, we resolved to give him half-ounce doses of tincture of digitalis according to Jones's directions. Before giving him this first dose his pulse was 90, regular, and fairly good, but in half an hour the pulse rose to 108; in three hours' time the digitalis was repeated, and in an hour the pulse was 120, in three hours 150 and irregular, in four hours 200, very irregular, and very feeble; in four hours and a half it had fallen to 124, and had become much stronger and more regular. During the night it varied between 130 and 140, but next day at noon it had fallen to 90, and though intermittent was not irregular; in the evening it was 60.

Digitalis is said to be cumulative. We meet with patients who, whilst taking digitalis, remain for many days but little affected, and then suddenly the pulse falls to 40, 35, or even to 30 beats a minute. This abrupt occurrence of toxic symptoms is ascribed to accumulation of the drug in the system, absorption from the stomach having been more active than elimination through the kidneys, etc., hence, it is held, the digitalis accumulates in the blood and induces this sudden onset of symptoms.

With the powder, infusion, and tincture of digitalis we can do most things that digitalis is capable of doing, but there is another very active and useful preparation, viz., crystallized digitaline (Nativelle's). The dose of this is one quarter of a milligramme, *i.e.* about $\frac{1}{240}$ grain. Graham Steel, to whom we owe a great deal for his careful study of heart disease, recommends this dose twice or thrice daily; if the latter, he orders that it be given every eight hours to avoid cumulative action, which might arise if the three doses were all administered in the waking hours. The preparation is sold in parvules, each containing the above dose.

CONVALLARIA MAJALIS

We now know a considerable number of remedies which affect the heart and blood-vessels in the same way as digitalis, drugs which strengthen the rhythmic and tonic contraction of the heart, and raise arterial tension, the latter probably by their direct action on the blood-vessels, and not through the vaso-motor nerves.

Convallamarin (Convallaria majalis), Adonidin (Adonis vernalis), Strophanthin (Strophanthus hispidus), first investigated by Professor Fraser and recommended by him as a substitute for digitalis, Erythrophlæin (Casca) recommended by Brunton, and Sparteine (Cytisus scoparius) are the most important. Though these substances in their physiological action are much akin to digitalis, yet they differ from it in some respects—for instance, strophanthin is a far more powerful muscle poison than digitalis. Other differences might be instanced for this, and it is certain that, whilst having much in common, these drugs play each a therapeutical rôle of its own. While, no doubt each of these then is useful, it remains to be seen if any of then equal or superior to digitalis. Convallaria majalis has been one of the most studied, and it has certainly not yet established its claim to be considered equal to digitalis.

In Mr. Martindale's useful analysis of twelve thousand prescriptions, we find that whilst the tincture of digitalis was used three hundred times, that of convallaria was prescribed only five times, the extract of convallaria once only, and the active principles and the whole plant not at all. Since the last edition of this book, then, the drug cannot be said to have gained ground.

Convallaria has long been used by the Russian peasantry for dropsy. Waltz discovered in it two alkaloids, convallarin, a simple purgative, and convallamarin, on which its cardiac and vascular action depends.

Toxic doses cause in frogs progressive paralysis, muscular tremblings, and at last complete loss of reflex action and death. Moderate doses slow and strengthen the heart's contractions, larger doses accelerate the heart and cause irregularity. Doses that slow the heart heighten arterial tension. Convallaria acts directly on the heart, arresting it in systole, affecting, probably, like digitalis, the muscular tissue. It probably acts also directly on the blood-vessels, but does not seem to affect the other organs in any notable degree.

As regards its therapeutic value, opinions differ greatly; Sée considers it to be superior to digitalis, but other observers, for the most part, rank it as much inferior.

It is well to point out that there is no officinal preparation of convallaria, consequently the preparation of one pharmaceutist is often much stronger than that prepared by another. The dose of the tincture, of the British Pharmaceutical Conference formula, is five to twenty minims.

STROPHANTHUS (KOMBÉ ARROW POISON)

PROFESSOR FRASER first investigated this drug and introduced it into medicine. The seeds of Strophanthus hispidus are officinal.

It has a bitter taste. At one time it was said not to derange the gastro-intestinal canal, but subsequent observations have shown that it sometimes causes loathing of food, nausea, vomiting, and diarrhœa, which may be violent. In large doses it may produce a sensation of burning in the œsophagus and [illegible] When however, digitalis upsets the stomach, strophant[illegible] and may be usefully substituted.

Fraser has shown that like [illegible] In my experiments I find that [illegible] muscle. Fraser finds that it [illegible] striped muscle. It affects the heart in all respects like digitalis, and it also heightens arterial tension; but this is said to be due mainly to increased contraction of the heart, and but slightly to a contraction of the arterioles; this statement, however, has been controverted, and it is said by some to cause marked arteriole-contraction.

Dr. Bradford has tested, on animals, the action of strophanthus upon the general blood-pressure and especially upon the renal circulation, estimating the effects upon the kidney circulation by means of Roy's oncometer. He says, "It is well known from the work of Fraser that strophanthus heightens arterial pressure by increasing the force of the heart's beats. Thus this drug differs from digitalin and spartein where the increased cardiac action is accompanied by a constriction of the muscular coat of the peripheral vessels. On the kidney, as investigated by means of the oncometer, strophanthus has scarcely any action. The injection of the drug is followed by an exceedingly slight and transitory contraction, lasting but a few seconds. Further the drug does not increase the flow of urine, even when its effects on the blood-pressure are marked. Hence these results confirm Fraser's view that the action of strophanthus on the vascular system is almost limited to its action on the heart."

As Fraser has shown, it may be used as a substitute for digitalis; and if it should prove that strophanthus does not contract the arterioles, then theoretically we should expect that it would answer better than digitalis, since under the influence of strophanthus the heart would be spared the obstruction caused by contraction of the peripheral vessels. On the other hand to raise the blood-pressure appreciably, as strophanthus does, without at the same time narrowing the peripheral channels, would require a great expenditure of cardiac force, and it would involve also a much greater acceleration of the blood flow, peripherally, for we should have raised blood-pressure with comparatively open channels, *i.e.* with comparatively little resistance. To maintain this more rapid circulation would again mean a greater expenditure of energy. Theoretically one is inclined therefore to hold that the experimentalists who have found that there is contraction of the peripheral vessels are more likely to be correct.

Its relative value to digitalis cannot be regarded as decided even yet, but it is now generally held to be inferior to digitalis. It is certain that it is not nearly so much employed as it was a little while ago.[1] It must, however, be admitted that cases occur in which it succeeds where digitalis has failed; but the special indications for the use of strophanthus are not yet ascertained. It is generally held that strophanthus acts more speedily than digitalis, the latter being, as is well known, slow to manifest itself, two, three, or four days often elapsing before the effects on pulse and urine appear: this with ordinary dosage.

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[1] In Mr. Martindale's analysis of 12,000 prescriptions, for the year 1892, the tincture of strophanthus was prescribed 74 times as against 300 times for the *tincture* of digitalis.

Drasche found that strophanthus greatly relieved palpitation and dyspnœa in failing heart.

The drug has also been recommended in secondary failure of the heart occurring in renal disease, a condition I do not find benefited by digitalis.

Sometimes, like digitalis, it causes violent headache. It is said not to be cumulative, but on this point also the statements are conflicting. (*See* Wood, 1894, p. 413.) It is useless in renal dropsy. The dose of the tincture recommended is from three to ten minims, but I do not often obtain much benefit with smaller doses than five minims four times a day, and ten-minim doses are often required.

Whitla makes the suggestion that the digitalis treatment of cardiac failure may often be advantageously intermitted, and strophanthus with Easton's syrup substituted for the time being.

A crystalline, bitter glucoside strophanthin has been separated and is prescribed in doses of $\frac{1}{300}$ to $\frac{1}{100}$ grain, but the tincture is the preparation most in use.

SPARTEINE

THIS is an alkaloid derived from broom liquid; it is highly recommended by Sée, who regards it as superior to digitalis. The alkaloid is insoluble in water, but its sulphate is freely soluble, and is used in doses gr. $\frac{1}{4}$ to grs. ij. The accounts of its physiological action are somewhat discrepant. Some observers find that it first accelerates the heart, and that this action is due to paralysis of the vagi. Next that it slows the heart, increasing the force and duration of its contractions. In the case of full doses there is said to be no primary acceleration, the heart being at once slowed. After toxic doses the pulse is much accelerated and becomes irregular, hence in these respects sparteine acts like digitalis and its allies.

It heightens arterial tension. Dr. Bradford finds that in animals, "The kidney vessels are constricted by it to a marked extent, the flow of urine being considerably diminished, this diminution continuing for some time after the constriction of the renal vessels has ceased." It is therefore not a direct diuretic.

It is used in place of digitalis, and therefore is found useful in mitral disease, with irregularity of the heart's action. It regulates the pulse, increases arterial tension, diminishes venous congestion, accelerates the circulation, and then acts as a diuretic, removing dropsy; its diuretic action is in proportion to its influence on the heart. Sée recommends it in all cases of weak heart, or when compensation is deficient; he regards it as especially indicated where the pulse is irregular. Sée finds it useful also in typhoid states, presumably because of its action on the heart.

Sée ranks its efficacy above that of digitalis or convallamarin, but most observers find it decidedly inferior to digitalis.

It is not, as we have seen, a diuretic by its direct action on the kidneys, indeed, in some experiments on rabbits it diminished the urinary secretion, hence it is useless in renal dropsy.

Since its action is speedier and less persistent than that of digitalis, sparteine is preferable where a prompt and more temporary effect is urgently required. Its action develops in from thirty to sixty minutes, and lasts some five or six hours (Clarke and Sée; *see* Wood). Whitla dwells on the value of this prompt action and states that combined with strychnine it constitutes "the most reliable drug for combating urgent symptoms" of heart failure; he regards 1 grain, thrice daily, as a "fair medium dose."

In toxic dose sparteine acts powerfully as a depressant to the cerebro-spinal centres; it "kills by paralyzing the respiratory centre" (Wood).

The drug is recommended particularly in general nervous excitement, and is said to have yielded good results in Graves' disease and in nervous palpitation.

It sometimes excites slight diarrhœa.

ADONIDIN

THIS, a glucoside of *Adonis vernalis*, is given in doses of $\frac{1}{15}$ to $\frac{1}{3}$ or $\frac{1}{2}$ grain several times daily as a substitute for digitalis.

It is a yellowish white powder, very hygroscopic, and therefore tending to cake, but according to Merck its powers are not damaged by this. It is freely soluble in water and alcohol, and is best administered in chloroform water.

Dr. H. A. Hare has examined its action on healthy animals. In the case of frogs it first slows, then accelerates the heart, and finally arrests it in diastole. On warm-blooded animals it acts similarly, increasing the force of the heart's contraction and heightening arterial tension. At first it slows but ultimately accelerates the heart, arresting it in diastole. The initial slowing is due to stimulation of the vagus, and the subsequent acceleration to paralysis of the vagus. It heightens tension partly by increasing the heart's action, but chiefly by its stimulating effect on the vaso-motor centre, contrasting in this respect with digitalis. It is evident that in its influence on the vagus adonidin is like digitalis. Dr. Hare does not mention a direct action on the heart muscle, which is so conspicuous in the case of digitalis. In my experiments I find that adonidin affects the frog's heart in all respects like digitalis.

Dr. Bradford, in his experiments on blood-pressure and supply of blood to the kidneys, finds that in cats, dogs, and rabbits, adonidin acts very similarly to digitalis, but that it differs from digitalis in not increasing the urine, and in this respect acts like sparteine. By this we must understand that like sparteine, it has no *direct* diuretic action on the kidney, whereas digitalis is supposed to have *some* power of directly stimulating the kidney to an increased output.

Notwithstanding these differences, adonidin seems clinically to act just like digitalis, and to be indicated in identically the same diseases. It is mainly useful in mitral disease, slowing and strengthening the heart, heightening arterial tension, removing venous distension, and so *indirectly* increasing the secretion of urine, and removing the dropsy. It will be remembered that the chief value of digitalis as a diuretic in heart failure is essentially on account of its *indirect* powers of promoting the flow of urine.

Adonidin sometimes causes vomiting and diarrhœa, with intestinal spasm.

The plant is caustic and vesicating, and the crushed plant is sometimes used, as a domestic remedy, for blistering.

Adonidin has not gained ground of late years, and is comparatively rarely employed. It may be had recourse to, digitalis failing, or if at any time it be thought wise to suspend the digitalis course, temporarily.

TOBACCO

The active principle of tobacco is a liquid alkaloid, nicotine.

A poultice of tobacco leaves has been used to relieve pain, and an ointment, made by boiling half an ounce of tobacco in eight ounces of lard, if kept constantly applied to the breasts, is said to arrest the secretion of milk. In these respects it is probably inferior to belladonna. (*See* Belladonna.)

As several deaths have occurred through the application of tobacco to the abraded skin, it must be used with caution externally.

Tobacco produces nausea and sickness, accompanied by great weakness and faintness. It confuses the ideas, dims the sight, enfeebles the pulse, and makes the skin cold and clammy with profuse sweating. Owing to its prostrating effects it removes spasm. Tobacco in the form of clyster, or administered by the stomach, has been employed in colic of the intestines, and in strangulated hernia, but in spasmodic diseases generally chloroform has quite superseded it. Tobacco-smoking excites an abundant secretion of saliva, and hence some persons have maintained that tobacco-smoking aids digestion. Smoking acts on the intestines as a slight purgative, and no doubt a pipe or cigar smoked after breakfast is often sufficient to ensure an easy and satisfactory relief of the bowels, and is, perhaps, a practice not without advantage in habitual constipation.

Smoking in excess is, no doubt, a very injurious habit, disordering digestion, lessening the appetite, inducing restlessness at night with disagreeable dreams, and weakness both of mind and body. Chronic pharyngitis, with constant hawking, the mucous membrane looking like dirty-red velvet, may, in some instances, be clearly traced to excessive smoking. Chronic dyspepsia is sometimes a result. The habitual smoker has generally a thickly-coated tongue. Amaurosis has been caused by excessive smoking. The symptoms produced by excessive smoking soon cease when the habit is discontinued. If the tobacco is of good quality, and contains but little nicotine, the evil consequences are much less marked. In the cultivation of the plant, it is a point of importance to develop the aromatic principles, and to diminish the nicotine.

Nicotine causes in frogs tetanus, and then general paralysis. In warm-blooded animals there occur twitchings and startings, and tetanoid convulsions, excited by the slightest stimulus; the breathing is greatly hurried; ultimately the animal becomes very weak, or, if the dose is large, completely paralyzed. The alkaloid also excites perspiration, and in cats free salivation. It contracts the pupil, whether administered internally or applied topically. We have, therefore, here an instance of a solanaceous plant contracting the pupil and increasing most of the secretions; in these respects it acts in exactly the opposite way to most other solanaceous plants, with the exception of pituri, to which tobacco is very closely allied.

Nicotine tetanizes by its action on the cord; this is a first action, subsequently it paralyzes. This paralyzant effect is probably in part due to a depressant action upon the cord, in part to an undoubted paralyzant effect upon the motor nerves (Vulpian, Rosenthal, Krocker), the peripheral nerve endings being first affected. As to its action upon the sensory nerves there is some difference of opinion; according to Vulpian and Rosenthal they are unaffected. The voluntary muscles are unaffected (*See* Wood). The brain is unaffected.

Nicotine appears to tetanize the heart, for when this organ, from some mechanical cause, has ceased to contract, the direct application of nicotine re-excites the pulsations, and the heart soon becomes rigidly contracted—tetanized, in fact—then, of course, the beats again cease. In birds and mammals killed by chloroform, when the ventricles are immobile and dilated, and respond most imperfectly to stimuli, the application of a drop of nicotine immediately occasions strong contractions in the heart, and causes the organ to respond energetically to mechanical and galvanic stimuli. Injected into the circulation, it appears that nicotine first slows the pulse, then, towards the end (in toxic dose), accelerates it. The blood-pressure is raised *during* the period of slowing; ultimately it falls The retardation of the pulse is explained as the result of stimulation of the *intra-cardiac terminations* of the inhibitory apparatus, the subsequent acceleration to paralysis of the same. (*See* Wood.)

The experiments of Fraser and Brown show that nicotine, like other tetanizing substances such as strychnine, brucine, thebaine, codeine, and morphine loses its tetanizing properties when converted into ethyl or methyl compounds, but that, unlike these, the methyl and ethyl compounds of nicotine do not possess any paralyzing action on motor nerves. This difference inclines these observers to believe that the convulsions of nicotine are not produced in the same way as those arising from strychnine, brucine, thebaine, etc.

Nicotine has been highly praised in tetanus, and many recorded cases appear to show its usefulness in this fatal disease. It must be administered either by the rectum, or hypodermically. When put into the mouth, however, it very often excites a severe paroxysm, which may destroy life, by firmly fixing the muscles of the chest and causing asphyxia. It has also been used in strychnia poisoning with some reported success.

Tobacco-smoking frequently affords some relief in spasmodic asthma. but, like all other asthmatic remedies, it succeeds much better in some instances than in others.

Whether the active principle of tobacco is destroyed in the system, or is eliminated in any of the secretions, is, at present, unknown.

Nicotine is supposed to be diuretic, but we are not told under what circumstances.

CONIUM

We are chiefly indebted to Christison, Schroff, Kölliker, and Guttmann for our knowledge of the action of this medicine. Paul Guttmann, who has made some excellent investigations into the action of this alkaloid, says it is one of the most active and powerful poisons, being, indeed, scarcely second to prussic acid, yet some vegetable-feeders, such as the goat, sheep, and horse, are said to eat hemlock with impunity.

Conium contains two alkaloids, coniine and methyl-coniine.

The smell of conium has been compared to the urine of mice. It has a burning acrid taste, provoking an increased secretion of saliva.

Conium exerts no influence on the unbroken skin, even when applied in large quantity, but strong preparations applied to wounds excite inflammation, with its usual accompaniments of heat and pain.

The pounded leaves, or the expressed juice, or other preparation of the drug, smeared over a poultice, will ease the pain of ulcers, both simple and malignant, and, at the same time, improve the character of the sore. The unguentum conii of the B.P. Additions is prepared according to Dr. Whitla's formula, and is an excellent local anodyne. He recommends it highly in the treatment of rectal and anal pain and in pruritus caused by fissures and hæmorrhoids. "It should be inserted well up into the bowel." In these local affections ten or twenty grains of the sulphate of iron may be added to each ounce of the ointment if we desire to add astringency.

The alkaloid, coniine, whether applied directly to the eye or swallowed, causes dilatation of the pupils, sometimes with subsequent contraction. According to Harley, the dilatation is never very great.

A drachm of the succus conii in hot water, used twice or thrice daily as an inhalation, is extremely useful in the irritable coughs of bronchitis and fibroid phthisis. The formula of the Throat Hospital is :—Dried carbonate of sodium, 20 grains, dissolved in one pint of water at 140° Fah.; juice of conium, 2 drachms. The vapour of this is inhaled.

Passing to the effects of internal administration, we find that hemlock has scarcely any influence on the stomach and intestines. It may produce nausea, vomiting, and diarrhœa, but such occurrences are not common. Walshe has seen it relieve the pain of cancer of the stomach.

That coniine enters the blood is proved by the symptoms arising when it is swallowed, but the physical or chemical changes, if any, which it undergoes in the blood are at present unknown. Added to blood after its removal from the body, it produces in it no perceptible alteration.

The deficient coagulability and dark colour of the blood, which have been noted by some observers, after death from this drug, are often absent, according to others, and, when present, are due probably to a fatal asphyxia.

The effects of conium on man and animals is very similar. The best account of the symtoms occurring in a human being, from a poisonous quantity of the plant, is given by Dr. H. Bennett, who has recorded the case of a man who ate hemlock in mistake for salad. Weakness of the legs, so that the gait was faltering, was first noticed; as the weakness increased the patient staggered as if drunk, and at the same time the arms began to be similarly affected. Complete loss of all voluntary movement followed, and there was inability even to swallow. Lastly the muscles of respiration were slowly paralyzed, and the patient died from asphyxia. Up to the time of death the intelligence was apparently unaffected, but sight was destroyed. Slight movements in the muscles of the left leg took place.

The same, or nearly the same, sequence of events happens in the case of animals poisoned by hemlock. In rabbits, however, early and severe convulsions occur, but in frogs these are absent. In all the experiments and observations of Guttmann, gradual paralysis of the voluntary muscles, and then of the respiratory muscles, took place. The paralysis began first in the hinder extremities, next it affected the anterior limbs, soon afterwards the muscles of the trunk suffered, and lastly those of respiration.

Concerning the action of this poison on the heart, very conflicting statements have been made. Some authorities state that it reduces the frequency of the pulse, especially when the heart beats too quickly from disease, as from fever, etc. Even a small dose under such conditions suffices, say they, to produce a decided effect on the pulse, while in health the same quantity may exert no influence. Such are the conclusions of Wertheim.

Kölliker, Guttmann, and J. Harley, on the other hand, conclude that conium does not affect the heart. Harley, who gave the medicine in sufficient quantities to produce partial paralysis, says, "excepting as a transient emotional effect in nervous individuals upon the sudden accession of the symptoms, after a first dose of hemlock, the heart and blood vessels are absolutely unaffected by its operation. I have carefully determined this in persons of all ages—in the weakly infant not three months old, in the strong, in the debilitated, and in those who have intermittent action of the heart."

In experiments upon warm-blooded animals poisoned by hemlock the heart, it is true, soon ceases to beat; but this can be long retarded if artificial respiration is performed. In the case of the frog, the poison does appear to leave the heart unaffected.

Coniine affects chiefly the motor nerves, paralyzing first the end plates. It also paralyzes the terminations of the vagus. The spinal cord is but little affected. Some experimenters assert that it affects the cord to a slight extent, like strychnia, and depresses the reflex function. The sensory nerves and muscles are unaffected.

Coniine appears also to affect the vaso-motor nerves, thus the arteries of the frog's foot fail to contract on irritation when the animal is poisoned by hemlock, but the motor nerves of some other involuntary muscles are uninfluenced by conia, *e.g.*, the peristaltic movements of the intestines of rabbits killed by the alkaloid continue active after death.

The influence of the drug on the brain must next be considered. There is no doubt that both man and animals remain conscious of pain so long as they are capable of giving signs of it, that is so long as the muscles of expression are unparalyzed. But consciousness of pain is possible, though at the same time the brain may, in other ways, be affected. Schroff, for instance, states that the poison, soon after it is taken, is followed by a sensation of heaviness in the head, with giddiness, inability to think, great impairment of common sensibility, blunted taste, dimmed sight, dilated pupils, and a sensation as of insects crawling on the skin. The mind, indeed, is evidently in some degree weakened, and many of the special senses may suffer. In Dr. Bennett's case there was total blindness, though the hearing was little, if at all, dulled. Some observers, however, assert that the mind remains quite uninfluenced by hemlock.

In poisoning by hemlock, as has been said, the pupil dilates, at the same time there is drooping of the upper eyelid, due, of course, to paralysis of the third nerve; this leads Dr. H. Wood to conclude that hemlock affects the pupil by paralyzing the third nerve, and not by stimulating the sympathetic.

At an early part of this section it was stated that convulsions resulted from poisoning by conium. Convulsions occur in some animals, not in others. Rabbits appear to suffer from convulsions, but frogs die unconvulsed. These spasms, Kölliker has suggested, may be due to asphyxia from paralysis of the muscles of respiration. This explanation, however, appears to be insufficient, for convulsions are often among the earliest symptoms, appearing, indeed, before asphyxia has had time to show itself; nay more, if a tube be introduced into the trachea and asphyxia be prevented by artificial respiration the convulsions may still occur. In man convulsions are certainly absent sometimes, and in the case recorded by Bennett, slight movements, only, in the left leg were witnessed.

Drs. Crum Brown, and Fraser, have shown that specimens of coniine are not of identical composition; for, while each specimen produced the same symptoms, these were not always produced in the same way. For instance, one specimen would affect chiefly the motor nerves, while another would act on both motor nerves and cord. The observations of Brown and Fraser on hydrochlorate of coniine, methyl-coniine, and iodide of dimethyl-coniine explain these differences in a great measure. They conclude that coniine "produces paralysis solely by influencing the motor nerves," but that hydro-chlorate of methyl-coniine acts "on the motor nerves and spinal cord." Further that "with large doses the former action is completed before the latter." As the result of their experiments they infer that commercial specimens of conia consist of mixtures, in variable proportions, of coniine and methyl-coniine; that sometimes methyl-coniine is present in small, at other times in large, quantities; and that this variety of composition explains the varied physiological effects of different specimens of coniine.

Their observations on iodide of dimethyl-conium show, "that the paralysis produced by dimethyl-conium is dependent on an action on the motor nerves primarily restricted to the peripheral terminations."

In doses sufficient to produce physiological effects, conium, says

Harley, may be taken for months without affecting nutrition: my experience quite confirms this statement.

We have the high authority of Dr. Neligan in favour of hemlock in various painful affections, such as cancer, rheumatism, and neuralgia. It has not yet been shown in any well-authenticated case that conium produces either sleep, coma or delirium.

Considering the physiological action of coniine, it would appear that it is not indicated in convulsive diseases dependent on affections of the cord, such as tetanus and strychnia poisoning; for the effects of this drug and the symptoms of these diseases are not antagonistic. Guttmann put to the test of direct experiment the power of coniine to arrest or check in any degree the tetanus from strychnine. He strychnized frogs, and then gave them coniine, but even when administered in doses sufficient to completely paralyze other frogs, the drug failed to check in any degree the tetanic spasms produced by the strychnine.

Professor Christopher Johnson, of Maryland, however, reports cases of recovery from severe traumatic tetanus under the use of coniine. In one case he injected hypodermically, every two hours, fifteen minims of a solution composed of two minims of coniine, one minim of dilute sulphuric acid, and one drachm of water. In the second case he commenced with twenty minims of the same solution every three hours; he subsequently increased the dose of coniine till, ultimately, rather more than a drop was taken every hour, upon which the symptoms abated. Afterwards he used two minims of coniine hourly, but, owing to the weakness of the pulse, returned to one minim every two hours; however, the spasms returning, he again used two minims every hour, and immediately they diminished. These cases, unfortunately, are much less satisfactory than they might have been, for in the first place, the cicatrices of the wound were removed by a hot iron, and in the second place bromide of potassium and morphia were also administered. Dr. Johnson, however, says that the spasms were considerably reduced after each coniine injection.

It will strike us at once how very similar is the action of coniine to that of curare, but one difference there is between these substances which has not been noticed: curare, when swallowed, is not poisonous, though it is strongly toxic when injected under the skin; coniine, in either way, is equally poisonous.

Claude Bernard believes that the innocuousness of curare administered by the stomach is due to its relatively slow absorption, as contrasted with its much more rapid elimination by the kidneys, for this would have the result that only a very minute quantity would be in the blood at a given moment.

Conium is supposed to be useful in whooping-cough and in other coughs. The succus conii in one to four drachm doses, or even more, has been recommended lately by J. Harley in chorea; these large doses certainly do control the movements temporarily, and impart steadiness to the patient, but the improvement wears off if the medicine is not soon repeated. Some cases, no doubt, are cured, but in my experience this treatment is in most instances palliative only, and, on discontinuing the drug, the symptoms return with ordinary severity. In order to maintain the effects of conium on the choreic movements, the dose must be increased rapidly, for patients speedily become tolerant of the drug, and after a short time will bear enormous doses without the induction of any physiological effect. Thus on one occasion I gradually increased the dose till the patient—a child—took, except when asleep, seven drachms of the succus conii hourly.

For internal use the most reliable preparation of the plant is the succus conii.

If the alkaloid be used it should be as the hydrobromate, which is a crystalline and fairly stable salt. The dose of this will be $\frac{1}{3}$ grain gradually increased up to 2 grains. Binz sets the dose at a much lower level, viz.—$\frac{1}{60} - \frac{1}{12}$ grain, but advises that the administration should be every hour, stopping on the first appearance of weakness of respiration. Should respiratory paralysis appear, in any and every case of conium poisoning, recourse must be had to artificial respiration.

Dujardin-Beaumetz calls attention to the much greater efficacy of conium when injected beneath the skin; he recommends that the dose should be $\frac{1}{6} - \frac{1}{3}$ grain of coniine hydrobromate.

Conium has been used not only as a sedative in peripheral affections, *e.g.* the neuralgias, sciatica, tic douloureux, but also in cases of cerebral excitement, hysterical, maniacal. In the latter class Dr. Savage has given it in very large doses, viz., from two drachms to two ounces of the succus, thrice daily, without causing bad symptoms. It is a very uncertain remedy.

Its special indication is motor excitement of all kinds.

We would again insist on the value of the B.P. ointment as a local sedative.

CURARE

THIS, the inspissated, watery extract obtained from certain species of strychnos, has been used chiefly by physiologists. It causes general paralysis of all striped muscular tissue, excepting that of the heart, by an action upon the motor nerve endings.

It kills by paralysing the muscles of respiration.

It has been used, hypodermically, in the treatment of convulsions of spinal origin, in particular in tetanus, and in hydrophobia. Unfortunately the preparations of curare are unreliable and in solution quickly, the specimen therefore, unless tested upon the frog or other animal before using it therapeutically, may be employed fruitlessly. A healthy frog should be paralysed by the hypodermic injection of $\frac{1}{650}$ grain of curare, within a few minutes; a medium-sized rabbit by $\frac{1}{20}$ – $\frac{1}{12}$ grain (Binz).

The dosage of curare in cases of tetanus and hydrophobia must always be more or less tentative; as much as 3 grains, in divided, frequent doses, have been given within 4 hours, and in another case some 5·5 grains were injected, in $\frac{1}{4}$ grain doses, within 22 hours. In both cases there were no bad symptoms from the curare (Binz).

CALABAR BEAN

POISONING by Calabar bean derived from the Physostigma venenosum induces the following symptoms:—Weakness progressing to complete paralysis; arrest of respiration; quivering or fibrillary contraction of the muscles; increased secretion of saliva; relaxed bowels with griping pains; contracted pupils; heightened arterial tension; sometimes strychnia-like tetanus; whilst the mind remains unaffected.

Two alkaloids are contained in the bean, viz., physostigmine or eserine and calabarine.

The drug leaves the brain apparently unaffected, but paralyzes the medulla and spinal cord, in particular, the motor centres of the anterior cornua; thus it causes weakness and paralysis and arrest of respiration. The motor nerves are very little affected, and the sensory only when a strong solution is applied topically to the nerves.

The fibrillary contractions are due to the direct action of the poison either on the muscle fibre or on the motor nerve, for they occur when the limb is separated from the nervous centres; and since the contractions are controllable by curare they depend probably on some change in the terminations of the motor nerves.

Physostigma increases most secretions, *e.g.*, the salivary, lachrymal, and cutaneous secretions, and the secretion from mucous membranes generally; this action is probably direct upon the glandular secreting cells. It also stimulates voluntary and involuntary muscular fibres or their peripheral ganglia, and hence gives rise to colicky pains and a more vigorous peristalsis of the bowels. It also contracts the bladder, uterus, and spleen.

It contracts the pupil, diminishing intra-ocular pressure, and producing spasm of the muscle of accommodation, probably by a stimulation of the terminations of the third nerve, and not by a paralysis of the sympathetic. It is used extensively in eye diseases.

It first accelerates the respirations by stimulating the vagi terminations, subsequently the respirations are retarded. In the end stages the breathing fails owing to a paralytic action upon the respiratory centre.

Physostigma affects the heart in a variable way according to the dose; a small quantity strengthens and lessens the frequency of the contractions, a large quantity kills, arresting the heart in diastole.

The increased arterial tension which obtains in the earlier and middle stages, is largely due to the strengthening influence of the drug on the heart, though probably in some measure to vaso-motor stimulation, or direct action on the muscular coat of the arteries.

The strychnine-like convulsions, sometimes recorded, are probably due to calabarine, which is reported to act like strychnine, whilst all the other symptoms are due to eserine.

We now come to the therapeutical application of this remedy. It was some time ago suggested that the Calabar bean might prove of much service in tetanus and chorea, and Dr. Fraser has written an interesting paper on this subject. Finding that the effects of strychnia on the frog can be arrested by physostigma, he has suggested that the bean may be used with the greatest benefit in tetanus. Dr. Fraser very naturally insists on the importance of employing the drug at the very beginning of the attack. It may be administered by mouth, anus, or subcutaneously. When the convulsions are severe, and when the slightest movement excites them, it is obvious that, till the severity of the paroxysms is subdued, only the subcutaneous method is available, yet, whilst the patient can still swallow, my experience leads me to prefer giving the drug by the mouth. To be of any use the drug must be given in quantity sufficient to produce paralysis, and must be pushed, indeed, to such an extent, that but a little more would permanently arrest the breathing. The drug, therefore, must be given with great care and watchfulness, and to get the necessary effects without inducing serious symptoms it is better to give small and increasing quantities every hour, or oftener, for then, should serious paralytic symptoms arise, the drug can be stopped. Moreover, it is impossible to tell beforehand the dose adequate to subdue the paroxysms and produce paralysis, some persons requiring a much larger quantity than others. Hence it is evident that it is more convenient to give the liquid extract by the mouth than subcutaneously. It is generally, nay, probably always, necessary to produce a certain degree of paralysis, amounting, *e.g.*, to heaviness of the limbs. To prove efficient the dose of the spirituous extract must sometimes be very large, thus, Dr. Eben Watson, who failed to obtain good effects from hypodermic injection, and who prefers to administer the drug by the mouth, or rectum, insists on the necessity of giving enough extract to produce relaxation of the spasms. He has given it to the extent of seventy-two grains in the twenty-four hours.

In a successful case under my care, reported in the *Practitioner*, the patient, for a day and a half, took 2¾ grains of the watery extract hourly, and for a short time 4 grains hourly. It is, of course, too much to expect that Calabar bean will cure every case of tetanus, but I feel convinced that, were the treatment begun at the outset of the attack, and were the drug pushed sufficiently, the results would be more successful than those at present attained.[1]

Dr. Fraser next makes a few remarks on the influence of this remedy over chorea, but at present there appears to be little evidence on this subject. "The treatment of this disease," he says, "will rarely require to be so active or energetic as that recommended for tetanus. Physostigma should be administered either in the form of the powder or tincture. From three to six grains of the powder, three or four times daily, may be given to children, and from ten to twenty grains, as frequently, to adults." Bouchut and Reiss still advocate the usefulness of this drug, the former gives it by the mouth in doses of $\frac{1}{40}-\frac{1}{15}$ grain of the sulphate of physostigmine, the latter hypodermically to the extent of gr. $\frac{1}{10}$ of physostigmine twice daily. Dujardin-Beaumetz regards physostigma as a dangerous remedy, and this represents the more general view. (*See* Whitla, *also* Burney Yeo.)

Sir James Crichton Browne finds Calabar bean markedly useful in general paralysis of the insane as a means of modifying or even arresting the progress of the disease.[2] I also have known it to arrest the progress of general paralysis, and even slightly to improve the mental and physical condition. I have seen it not only arrest progressive muscular wasting, uncomplicated with much mental disorder, but also effect considerable improvement in the muscular power. Moreover, it has appeared to me to be serviceable in some cases of long-standing hemiplegia. I have given the extract of physostigma in one-thirtieth of a grain dose every two hours. In Crichton Browne's cases the dose was $\frac{1}{4}-\frac{1}{3}$ grain of the extract of physostigma. This was given continuously for 9 to 12 months.

In conjunction with Dr. Murrell, I have made observations on the influence of Calabar bean on certain nervous affections, giving one-tenth of a grain of the extract every three hours, and in some instances we have continued this treatment for more than a year. We gave it in five cases of paraplegia, due probably to myelitis. In one case no improvement ensued, and but slight amendment in another, but even when the drug failed to produce any improvement it yet seemed to us to arrest the disease. In old-standing cases where the lower part of the cord had become disorganized, we could hardly hope for any amendment, but one might perhaps hope to control the march of the disease in the less affected parts. In two cases very marked improvement occurred, an improvement so decided as to fairly astonish us, but in both relapse took place, and the patients again became as bad, almost, as before undergoing treatment.

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[1] In the treatment of tetanus Calabar bean cannot be said to have established itself more firmly of late years [illegible] its own as one of the remedies to which we may h [illegible] be pushed, as above recommended, to the [illegible] The subject is exceptionally diffic [illegible] in the fatality of cases of tetanus [illegible]

[2] More recent investigations [illegible] this out.

In the fifth case the treatment effected a considerable and permanent improvement, so that the patient, who was unable to move his legs even in a slight degree, was enabled, before his discharge, to walk about the ward without his stick. These cases, it will be said, do not tell conclusively in favour of the efficacy of physostigma in paraplegia; we were both, however, struck by the evident temporary improvement in some of the cases, and the decided and permanent amendment of one patient, which we could not help attributing to the drug, and we feel sure that this subject is well worth further investigation. We gave the drug in the same dose to two cases of locomotor ataxy, in one case for a year, in the other for three months: both cases improved, and one, a very bad case, considerably. We gave it also in a recent case of writer's cramp, and in two months the patient recovered.

Dr. Bartholow recommends Calabar bean in the flatulence of the climacteric period.

Between Calabar bean on the one hand, and chloral, atropia, and strychnia respectively, there is a well-marked antagonism. Here we shall have occasion to speak only of the antagonism between physostigma and chloral, referring the reader for an account of the other antagonisms to the chapters on belladonna, and on strychnia. The Committee of the British Medical Association, in their recently published investigations concerning the antagonism between drugs, concluded that the antagonism between physostigma and chloral is greater than that between physostigma and atropia. They have pointed out that the antidotal properties of a drug are, of course, modified by its more or less rapid action on the system. Serious and even fatal symptoms ensue from Calabar bean much more speedily than from chloral; therefore, to obtain the antagonistic effects of chloral, it must be given either before, or immediately after, the ingestion of Calabar bean. The antagonism is not complete, for, in spite of an antidotal dose of chloral, physostigma, although convulsions may be averted, will still produce muscular twitchings, tremors, salivation, and contracted pupil; moreover, a quantity of Calabar bean in excess of a minimum fatal dose will kill, chloral notwiths ing.

For the use of physostigmine in ophthalmic practice we
to special treatises. It is employed as a local application
form of the lamellæ (official) or of a solution of the sulph

to the ounce. Its main action is to contract the pupil and lessen intra-ocular tension.

MUSCARINE

Muscarine, the active principle of poisonous fungi, was first extracted from the *Amanita muscaria* or fly agaric, and physiologically tested by Schmiedeberg. He has since discovered in this fungus a second alkaloid, identical with jaborin, an alkaloid of pilocarpine, and this second alkaloid is antagonistic to muscarin, just as jaborin is antagonistic to pilocarpine. His conclusions regarding muscarin have been confirmed and our information extended by the researches of Koppe, Prevost, Alizon, Lauder Brunton, and Schiff. Great interest attaches to muscarin on account of the close similarity of its action to pilocarpine and its almost complete antagonism to atropine. Thus it increases the secretions generally of the skin, the salivary and lachrymal glands and the glands of the alimentary tract including the secretions of the liver and pancreas. In its action upon the stomach it may cause nausea and vomiting. On the intestine it acts as a powerful stimulant to the peristaltic movements. Muscarine excites a strong desire to pass water. It causes the pupil to contract, when administered internally, but curiously, when applied topically to the eye produces mydriasis.

Upon the heart it exerts a paralyzant effect, arresting it in diastole; the blood-pressure falls. Its action upon the heart is supposed to be the result of stimulation of the intracardiac inhibitory apparatus.

In sufficient dose muscarine causes intense dyspnœa; this has been shown to depend upon a spasmodic contraction of the pulmonary blood vessels, whence the right heart becomes much distended and the aëration of the blood is seriously interfered with.

In conjunction with Dr. E. A. Morshead I made some investigations regarding the action of muscarin on the human body.

Our observations were undertaken to endeavour to ascertain whether the action of muscarin on man is the same as on animals. The muscarin we employed was synthetically prepared by Merck, of Darmstadt. In the following experiments we administered the drug hypodermically. We made thirteen experiments on four men. These men, it is well to state, were not in good health, three were in a delicate anæmic state, the other had slight fever from some obscure cause, though his pulse was not quickened.

A large number of preliminary observations were made to ascertain the minimum dose adequate to produce symptoms. This we found to be a third of a grain given hypodermically.

We found that the action of muscarin on man is identical with that on animals. It contracts the pupil, excites profuse perspiration, free salivation, running at the eyes and nose; it purges, sometimes excites nausea and vomiting, and a strong desire to pass urine.

We shall now speak more in detail of these different effects.

Perspiration.—Sweating occurred in eleven of the thirteen experiments. Half a grain always made it free, whilst larger doses, such as three-quarters of a grain or a grain, rendered it very abundant, quite as free, indeed, as the perspiration [illegible] grain of pilocarpine. After the larger doses [illegible] the face, the night-dress became soak[illegible] though we gave one-third of a grain and one grain respectively in two experiments, we produced no sweating, but free salivation, amounting to four ounces. Perspiration began in from three to fifteen minutes, occurring earliest after the larger doses. It lasted from half an hour to an hour and a half. On testing the reaction of the sweat in six experiments we found it neutral in four and alkaline in two.

Salivation was not so constant as perspiration; moreover, the saliva varied in quantity more than the perspiration, corresponding in this respect to pilocarpine. Salivation occurred in nine experiments, and was absent in four. In three it was slight, in the rest free or profuse. It began in from two to fifteen minutes, and lasted from twenty to eighty minutes.

Lacrymation occurred in eight cases, amounting in some instances only to suffusion of the eyes, but generally the tears trickled down the face, so that the patient was obliged to wipe his eyes. It began in six to ten minutes, and lasted generally about twenty to thirty minutes.

Purgation.—In the cases in which it purged, the injection took effect in from ten to twenty minutes. In two experiments the drug excited an inclination to pass a motion; in four experiments on the same man it produced a loose motion, of a green colour, though the bowels had been opened naturally a short time previously.

In three of our experiments made on one man with the larger doses, the drug induced vomiting once, and once nausea.

Pulse.—In one of our four men the pulse was always very quick; in the other three it was natural. The effect on the normal frequency was *nil*, or almost *nil*, though in one man, on whom only one observation was made, it reduced the frequency ten to sixteen beats. The medicine reduced the quick pulse from 120 to 80 and 60 beats per minute. Our observations are too few to enable us to speak with certainty of the influence of muscarin on the pulse, but it appears to us that the doses we employed affected the frequency very little, but that the larger doses made the pulse softer and more compressible.

Respiration.—The frequency of breathing was unaffected in every experiment.

Sight.—We have notes of the state of the pupils in ten experiments only. In each of these cases the pupils became contracted, often considerably; the contraction beginning in about fifteen minutes. The vision seemed unaffected.

In five experiments the patients were obliged to pass urine within from nine to fifteen minutes after the injection, and two complained of suprapubic pain. In five the drug produced a frequent hacking cough. In none did headache or other nervous symptoms arise.

The section on Jaborandi will show how marked is the similarity between the action of it and of muscarin. There are, however, slight differences. The perspiration and salivation are generally greater after pilocarpine, and last a longer time, though possibly larger doses of muscarin might in this respect rival pilocarpine. We are led from our experiments to conclude that muscarin acts rather more on the lachrymal glands than pilocarpine. Muscarin certainly acts on the bowels far more powerfully than pilocarpine. Muscarin, internally administered, contracts the pupils more strongly than pilocarpine. On the other hand, jaborandi produces more suprapubic pain, and more frequently and more strongly the impulse to pass water. Pilocarpine produces headache and giddiness, symptoms never yet noticed by us after muscarin. In our experiments with muscarine none of our patients complained of any disturbance of the sight, but on this point we have not sufficiently examined them. Pilocarpine produced a little drowsiness, but we have not observed this after muscarine. In our experiments on man, pilocarpine quickened the pulse in every case, and as this fact has been amply corroborated by other observers, we may conclude that it is established, though Langley, in his experiments on animals, finds that it slows the heart, acting thus on animals like muscarin. In our experiments on man, muscarin produced very little effect on the pulse; if it altered frequency at all, it reduced the number of beats.

Whilst muscarin thus so closely resembles pilocarpine in its action on the body, in one respect it differs strangely. Administered internally, either by the stomach or subcutaneously, pilocarpine slightly contracts the pupil; topically applied to the eye it strongly contracts the pupil. Muscarin, given hypodermically, contracts the pupil far more than pilocarpine; but when applied to the eye itself, it dilates the pupil widely. Thus, whilst it is so generally antagonistic to atropine, in this one respect of direct topical action it resembles it. In respect to this action on the pupil it corresponds to gelsemium, which, administered by the stomach, contracts the pupil, but applied locally, dilates it widely.

We tested the topical effect of muscarin in nine cases, using a solution containing one part of the drug in ten of water. This solution produced very little or only transient smarting. In every case the pupil became dilated, generally widely dilated, the dilatation beginning in from a quarter to three-quarters of an hour, and continuing about twenty-four hours or a little longer.

Muscarine is usually administered in the form of the nitrate and the dosage referred to, viz., from ⅓ grain to ¾ grain will apply to the salt also. Nitrate of muscarine is a viscid, yellowish brown liquid, incapable of crystallizing.

The chief employment of muscarine has been as a means of checking profuse sweating, especially in phthisis. Murrell gives five minims of a 1 per cent. solution, hypodermically, for this purpose (Whitla).

In poisoning by fungi generally, atropine should be injected, say in dose of $\frac{1}{60}$ grain; this dose to be repeated, if necessary, till the pupils begin to dilate. Whitla is satisfied that in this way "he has saved several lives" in the case of a number of school children poisoned by fungi.

AGARICUS ALBUS

Another species of fungus, the white agaric, has been introduced into medicine. From it has been obtained an active principle, agaricine, which is of the nature of an acid, and occurs in the form of a white crystalline powder; it is dibasic and is a homologue of malic acid (Binz). It is very bitter.

The fungus itself in the form of powder is administered in dose of 10-30 grains in the treatment of excessive sweating. Agaricine, *i.e.* agaricinic acid is given in the form of pill in dose ⅛ to 1 grain, in the same affection. Its anhidrotic powers manifest themselves in some 5 or 6 hours. It is of special service in the night sweats of phthisis, as a treatment for which Dr. Murrell first introduced it. It is generally administered in dose of $\frac{1}{12}$ - ⅛ grain, shortly before bedtime, but in severe cases it may be necessary to administer ⅛ grain every 4 hours (Whitla). It is often combined with small doses of Dover's powder; it is also given with aromatic sulphuric acid 10 or 15 minims.

Agaricine is said to be without after-effects.

The fungus itself in large dose causes purging. In overdose it or agaricine may cause death by paralyzing the respiration and the circulation.

JABORANDI

THIS plant contains four alkaloids: pilocarpine, on which its effects mostly depend; jaborine, which, strange to say, has an action like atropine, and therefore is antagonistic to pilocarpine (jaborine is present only in small quantities); pilocarpidine and jaboridine—pilocarpidine acting like pilocarpine and jaboridine like jaborine. Pilocarpine can be easily transformed into jaborine, and pilocarpidine into jaboridine.

This active and interesting drug, long in use in South America, was lately brought from Pernambuco to Paris by Dr. Coutinho, who recommended it as a powerful diaphoretic and sialagogue. Dr. Coutinho advised the patient to drink the infusion together with the suspended leaves, then to go to bed and cover warmly. This done, in about ten minutes, the face, ears, and neck become deeply flushed, and soon drops of perspiration break out over the body, whilst at the same time the mouth waters. Within a short space of time the perspiration increases rapidly, the sweat running down the body and soaking the clothes, whilst, concurrently, the salivation becomes profuse, sometimes actually oozing from the mouth in an almost continuous stream. The sweating and salivation persist from two to four or five hours. Occasionally it happens that perspiration fails to occur; salivation is more frequently absent: when the drug fails to cause sweating it salivates, and *vice versâ*. The symptoms come on, as I have said, in about ten minutes, but sometimes, if the external conditions are not favourable, the symptoms may be much delayed, even for an hour or longer, and then, perhaps, are only brought on by brisk exercise. Hypodermically injected, the alkaloids act in three to five minutes.

The amount of saliva secreted may amount to a pint, or a pint and a half.

Pilocarpine promotes other secretions, such as the tears, the bronchial and the intestinal secretions, these, however, to a far less degree than the salivary and cutaneous secretions. Thus the eyes may water slightly, and at times there may be a little running at the nose, and a somewhat loose cough. Some observers state that the drug relaxes the bowels, an effect I have never witnessed in my numerous observations. In many cases the effects on the tears, etc., are absent. Pilocarpine does not increase the biliary secretion.

During the sweating the body temperature will fall from 0·4° to

1·4° Fah.; the average in my observations conducted with Mr. Gould being 0·9°. The depression of temperature lasts from one to four hours. This effect on the temperature is no doubt due to the perspiration, heat being lost by increased evaporation and radiation, more blood being probably sent to the skin during the sweating period.

In the human subject jaborandi always quickens the pulse, my original assertion on this point having been abundantly confirmed by subsequent observers. Strange to say, Mr. Langley finds that the heart of warm-blooded animals and of frogs is slowed, and as regards frogs I have repeatedly verified his statement. The pulse in man is increased from 40 to 50 beats, the acceleration continuing for more than four hours; at the same time the pulse is rendered weaker. Jaborandi slows, and at last arrests, the heart of frogs; this it does whether injected under the skin or applied directly to the heart. The heart stops in full diastole. If, when the heart has been greatly retarded, or even stopped, a minute quantity of atropia is applied to it, it will soon begin to beat again, and, ultimately, it will quite or almost recover from the effect of the pilocarpine. Mr. Langley's experiments lead him to conclude that jaborandi slows and arrests the heart by stimulating the same nervous apparatus that atropia paralyzes, namely, the intracardiac inhibitory apparatus.

It is curious that whilst jaborandi slows and arrests in diastole the heart of frogs, and, according to Langley, the heart of warm-blooded animals also, it greatly quickens the heart of man. We see the same contradiction in the action of atropia on man and the lower animals. For whilst atropine quickens and strengthens the heart in man, horses, dogs, etc., a full dose swallowed, or topically applied, will arrest the frog's heart in diastole.

Jaborandi first flushes the face, then makes it pale. The pallor comes on when the sweating is active, showing that the sweating is not due to the excess of blood sent to the skin.

Pilocarpine induces increased glandular secretion by stimulating the ends of the secretory nerves.

Remedies excite sweating through their influence on the nervous system, some acting on the sweat centres in the cord, others on the peripheral secreting apparatus.

Acetate of ammonia, physostigma, nicotine, and picrotoxine, act on the cord; physostigma and picrotoxine on the sweat centres in the medulla. Pilocarpine acts on the peripheral nervous apparatus (Marmie and Nawrocki).

Ott concludes that muscarin acts on the *gland cells*, for on section of the sciatic nerve, in a warm-blooded animal, after an interval of nine days, stimulation of the peripheral end excites no perspiration, showing that the sweating nervous apparatus is paralyzed; but muscarin will still excite sweating in the foot of the leg with the divided sciatic.

From a few experiments I have made I think it probable that jaborandi promotes the secretion of milk.

It not unfrequently excites sickness. This can, in part, be accounted for by the large quantity of saliva swallowed; often, indeed, the vomit has consisted solely of saliva.

It often produces frontal headache, sometimes with giddiness and dulness. After the internal administration, the sight frequently becomes hazy, without any alteration in the size of the pupils. But the topical application to the eye, as I have shown, causes decided contraction of the pupil. Mr. Tweedy concludes from his investigations that jaborandi, applied locally, causes (1) contraction of the pupil; (2) tension of the accommodative apparatus of the eye, with approximation of the nearest and furthest points of distinct vision: (3) amblyopic impairment of vision from diminished sensibility of the retina. These effects, however, do not last long.

Jaborandi seems to be slightly narcotic, for patients often fell asleep during our experiments.

In many cases jaborandi produces pain, often severe, over the pubes, with a distressing irresistible desire to pass water, the pain at once subsiding on emptying the bladder. As the quantity of urine is not increased, it is probable that jaborandi excites contraction of the bladder.

Pilocarpine first stimulates and then paralyzes the motor nerves of involuntary muscular fibre. This action explains the suprapubic pain, the contracted pupils, and the increased intestinal movements. It also causes contractions of the uterus.

Pilocarpine affects children less than adults.

It is evident, from the previous account, that there is a marked antagonism between atropia and pilocarpine. In some minor respects, however, they correspond, thus both produce frontal headache and suprapubic pain, with desire to pass water. In order to test the antagonism between these two drugs I have, on many occasions, administered pilocarpine, and when the sweating was profuse, I have injected hypodermically, $\frac{1}{150}$ grain of atropia, and in five to ten minutes the skin has become quite dry, and the salivation has ceased. Strange to say, not only has atropia removed the antagonistic effects of pilocarpine, but likewise those other symptoms common to both drugs, namely, headache and the desire to pass water.

Jaborandi is useful in Bright's disease, especially on the occurrence of uræmic symptoms; it acts by establishing free diaphoresis. If uræmia is urgent pilocarpine may be injected hypodermically, and I have seen marked improvement follow this treatment. By the mouth drachm doses of the liquid extract should be given several times a day. Large doses of the extract or full doses of pilocarpine produce much depression and cannot be continued.

In bronchitis, when the secretion of the tubes is viscid and scanty, jaborandi and its alkaloid have been used successfully. Dr. Beckart recommends the hypodermic use of pilocarpine in asthma; perhaps it acts in like manner by promoting a freer secretion from the mucous membrane.

G. Guttmann and many other writers commend pilocarpine highly in diphtheria. It manifests its action locally on the throat. It is stated that the promotion of free secretion from these parts detaches the false membrane. The experience of others, however, is not favourable to the employment of pilocarpine in this disease.

Some have recommended the employment of pilocarpine in mumps.

The accounts of some writers tend to show that this drug is useful in removing the effusions of pleurisy, hydrothorax, and ascites; it will act probably by virtue of the free elimination of water in the sweat and other secretions.

Bartholow finds that a local application of jaborandi is useful in baldness, and he recommends the following:—Extract of jaborandi one ounce, tincture of cantharides half an ounce, soap liniment one ounce and a half; to be applied to the scalp daily. Possibly, the action is due to the cantharides.

Not only do arresters of secretion, such as atropine, etc., check excessive perspirations, but sweaters, in small doses, are equally effectual in checking undue perspiration. Thus I have found that pilocarpine, in $\frac{1}{20}$ grain dose, thrice daily, is a most efficient remedy in excessive perspiration, as in phthisis. Muscarine and also Dover's powder, both of which promote a free perspiration, check too frequent sweating, and recently Dr. Murrell has shown that picrotoxine effectually checks the night-sweats of phthisis in $\frac{1}{150}$ grain dose.

Jaborandi may be administered in the form of infusion, or as tincture, a drachm of which is equal to thirty grains of the leaf, or as the liquid extract, half a drachm to a drachm three or four times a day, or as the alkaloid pilocarpine, of which half a grain to three-quarters of a grain may be given by the stomach, or a quarter to half a grain hypodermically.

The resemblance of jaborandi to Calabar bean in respect of the influence upon the secretions generally, and upon plain muscular fibre, including the action upon the eye, will not have escaped notice.

GELSEMIUM SEMPERVIRENS

This powerful drug has long been employed in America. Its physiological action has been investigated by Dr. Roberts Bartholow, Dr. Ott, and Dr. Berger. Introduced into this country as a remedy for neuralgia, it is especially useful in non-inflammatory toothache and in neuralgia of the nerves supplying the teeth and the alveolar processes of the jaw.

Gelsemium is a powerful paralyzer of the muscles generally and likewise a powerful respiratory poison. Its paralyzing action is best studied in the frog. In these animals it often produces tetanus as well as paralysis, the effect depending on the dose. Thus, as a rule, with small doses of the alkaloid, we get paralysis only; with rather larger doses, quiverings and tetanoid movements; after really large doses, decided tetanus.

Is the paralysis due to the influence of the drug on the brain, the cord, the motor nerves, or the muscles? It is due to action on the spinal cord, for the motor nerves and the muscles are unaffected.

The tetanus is due to the action of the poison on the cord, and I draw special attention to the fact, that the paralysis of the cord always precedes the tetanus; thus gelsemium has the property of first weakening and then tetanizing the cord, resembling in this respect jaborandi, buxus sempervirens, and other drugs.

It is a powerful respiratory poison; indeed, this drug, generally, if not always, destroys *warm-blooded* animals by asphyxia, before it has had time to produce complete general paralysis. It produces no primary quickening of respiration, does not paralyze the phrenic or the intercostal nerves, and acts after the division of both vagi. It asphyxiates, as Dr. Burdon Sanderson has shown, by paralyzing the automatic respiratory centre.

Some individuals, as might be expected, are much more prone to be affected than others. Thus one woman suffered from toxic symptoms after a second dose of ten minims, of a tincture, of strength, one in four of rectified spirit; and, in another case, two doses of twenty minims, at two hours' interval, produced well-marked symptoms, presently to be described. On the other hand, I have given drachm doses of the tincture hourly, for six hours, with very slight effect; and in one instance I gave twenty minims to a delicate young woman every three hours for several days, causing in the end only slight heaviness of the eyelids.

Unless given in dangerous doses gelsemium affects first and chiefly the eyes and brows: the symptoms produced generally occur in a certain order (not without exceptions). The drug, as a rule, causes in the first place pain in the brows, soon followed by giddiness, then by pain in the eye-balls, and soon after by dimness of sight. A larger dose produces double vision without apparent squinting, also a sensation of great heaviness in or under the upper eyelids, with some contraction of the pupils. A still larger dose causes drooping of the upper lid, sometimes so marked that the eye becomes nearly closed, and can be opened only by a strong and painful effort: after straining to open the eyes, the upper eyelid is sometimes so tired that ptosis for a short time becomes complete. The movements of the eyeball are restricted, and they were associated in one case with a strong doubl internal squint. The patient next is wont to complain of w in the legs; we have never pushed the drug beyond the pr this symptom. When decidedly under the influence of the drug, the patient is pale, and presents a heavy sleepy look. Some subjects say their eyes feel sleepy; others yawn frequently, and say they can hardly keep awake, and, when left to themselves, fall asleep. Others complain of dryness of the mouth, though the tongue looks moist, and to the finger feels so; some keep moistening the mouth with a little water, even for hours after the discontinuance of the medicine.

These symptoms occur in most instances, but occasionally even large doses of the tincture have induced only a few of the slighter symptoms. Thus, a woman who has taken a drachm dose of the tincture hourly, for six hours, without exciting headache, diplopia, or giddiness—nothing but a great heaviness of the eyes, and a dimness, amounting however to what might be described almost as a temporary loss of sight, this very woman may, on a former occasion, have suffered from extreme diplopia with giddiness, after taking four one-drachm doses of the tincture. Diplopia, as we have stated, is generally preceded by headache, giddiness, and dimness of sight, but, in the instance just mentioned, it occurred without these preliminary symptoms, although, strange to say, on the subsequent occasion, the larger quantity—that is, six one-drachm doses hourly—produced much giddiness and mistiness, but no diplopia.

The symptoms from gelsemium come on early, and subside soon. A single drachm dose of the tincture rarely produces any marked symptom, but in from ten minutes to a quarter of an hour after a second dose taken at the end of an hour the symptoms generally appear, and reach their highest point in about half an hour; they then as quickly subside, most of them ceasing in about an hour. With the repetition of four or six hourly drachm doses the symptoms may persist for six or eight hours after the last dose; but the symptoms are most marked half an hour after each dose, and then decline.

The patients describe the pain in the head and eyes variously. It is generally limited to the forehead, they say, and most marked just over the eyes. Some speak of it as a dull sensation over the eyes, others, as a heavy pain, yet others, as a giddy pain; one patient experienced pain over the occiput, with a sensation as of lifting the crown of the head off in two pieces. Sometimes the headache is absent, sometimes it follows instead of preceding, the other symptoms. Dull aching pain in the eyeballs, now and then shooting in character, occasionally worse in the one eyeball, will sometimes follow, sometimes precede the headache. The headache and pain in the eyeballs are often severe, and are intensified on moving the eyes. When ptosis is well-marked the effort to open the eyes widely causes considerable pain, and the patient seems to get relief by closing the eyes.

Giddiness is another prominent and early symptom. Standing or walking makes it much worse. When well-marked, the patients stagger and are afraid even to stand, much more to walk; so giddy was one patient, that he nearly fell off a form upon which he was sitting. Some describe their heads as going round and round. They both feel and seem drunk, though without any incoherence, or mental excitement.

In every one of our cases the sight has been affected; indeed, dimness of sight and giddiness appear to be among the most constant symptoms, and they may exist without headache, pain in the eyeballs, or double vision. At first, the sight, without being misty, is not so clear as usual; then a slight mist comes before the eyes, one patient comparing it to a "lot of smoke rising before his eyes," and another to a "thick veil." At last the sight becomes so affected that it fails almost completely, first for distant objects, then, on further impairment of vision, for near objects also, which look hazy. Gelsemium affects, likewise, the sight in animals. Thus, in a poisoned dog, after the production of slight muscular weakness, the sight became almost lost, for the animal would run straight against objects without trying to avoid them, evidently not seeing them.

The drug seems to produce two kinds of diplopia, one much more persistent than the other. As to the transient kind, we find that, on many occasions, it is a very passing phenomenon, lasting only a few seconds, and then disappearing, then again, after a few minutes, reappearing. In this transient form images in the median vertical line appear double, distant objects undergoing the duplication first. Sometimes the patient would be conscious of the onset of the diplopia: thus one woman said, "I know it is now coming on; I feel such a heavy weight under my upper eyelid." The double vision then came on, and, together with the heaviness, passed away in a few seconds. One image was higher than the other; the images in this respect varying much. Mr. T. Fox recorded rapidly, from the patient's lips, the phenomena as they occurred:—"One gas jet appears about six inches above the other, and there are six inches between them horizontally; the upper one is to the left; now the right is uppermost; now the left slightly again; now they are exactly one over the other, and quite close together; now again separated, the left the highest; now one above the other." In other cases the two images keep on a level. Sometimes the drug produces this transient kind of diplopia only; at other times both kinds; sometimes one kind precedes the other, the transient usually preceding the more constant form, and recurring from time to time, while the constant form persists.

The phenomena of the constant form of diplopia follow a definite order, and take place in the upper half only of the field of vision. They occur first for objects held at the extreme right or l visual field, and then, as the patient passes more and more influence of the drug, for objects held nearer and nearer to line; at last, though usually for a short time only, ob median vertical plane also appear double. As the effect wears off, the double vision disappears in the inverse order. The outer lateral image is the higher, and the further the object is carried to the right or left the greater is the horizontal and vertical distance between the images. When a coloured glass is placed before either eye the outer and higher image is seen by the covered eye. When the object is carried high above the head the two images gradually coalesce, and the object looks very much thinner, "like a thread." With well-developed diplopia there is impaired movement of the eyeball, chiefly affecting, as far as can be ascertained, the external and internal recti, especially the external; hence the outward and inward movements of the eyeball are less free than before the action of the medicine. The eyeball appears to be moved by a greater effort, and when carried as far as the weakened muscles are capable it begins to oscillate; it is just as though the patient, by a great effort, moved the eye as far as he could, and then the tired muscles gave way a little, upon which roused again to an effort, they carry the eye back again, the frequent repetition of this procedure giving rise to the oscillation.

The external rectus is generally affected first, and not infrequently one external rectus sooner than, and in excess of, the other, but even when the diplopia is strongly marked the loss of power over the muscles is not very great, and there is no obvious squinting. (We may remark here that we could not detect any squinting during the transient form of diplopia.) As the patient becomes still more affected, ptosis supervenes, and a great part, or the whole of the upper half, of the field of vision is then cut off. The loss of power in the eye muscles is then more marked, but still without the occurrence of obvious squinting. At this stage the visual symptoms no longer follow the order previously described, but assume various forms, often changing rapidly. Thus, whilst with the object on one side the outer image is the higher, if now it (the object) is carried to the other side of the field the inner image may become the higher; or, perhaps, for the first few seconds the outer and then the inner image is the higher.

In twenty-two out of thirty-three series of observations the pulse remained unaffected in frequency, whilst in the remaining eleven it was accelerated, the increase ranging from six to twelve beats in the minute. Curiously enough, even in the same patients the effects were variable, for although on some occasions the drug would accelerate the pulse, at other times it would fail to affect it. This was not a mere question of dose, for an increase in the dose did not affect the result. With the patient fully under the infl[illegible] the drug we were inclined to think that the [illegible]er and softer. These observations show [illegible] effect upon the circulation, a [illegible] the lower animals.

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on a rabbit, that gelsemium exerts no influence on the blood-pressure.

Gelsemium acts less powerfully upon the respiratory centre in man than in the lower animals, or, perhaps, to speak more accurately, we should say that in the human subject other parts of the nervous system are affected before the respiratory tract. Thus in man the drug produces giddiness, pain in the head, loss of sight, diplopia, and ptosis before the respiration is in any way affected. This ptosis may be so complete that the eyes cannot be opened, and the sight temporarily almost destroyed, yet the breathing may not be altered in character, or, at all events, be only slightly more superficial. It may be said that the symptoms we have enumerated may have been overlooked in the lower animals. I, of course, cannot answer for the pain in the head and giddiness, but I am enabled to speak positively as to the absence of ptosis. I frequently noticed that when an animal was so fully under the influence of the drug as to be on its side in a condition of absolute helplessness it was still able to open its eyes widely, and apparently without the slightest effort.

In the lower animals gelsemium, as we have seen, acts first on the respiratory centre, then on the spinal cord. In man, however, the muscles of the upper eyelids, or more probably their motor nerves, are considerably affected before either the cord or respiratory centre. Moreover, if the cases of poisoning are correctly reported, we are justified in concluding that in man the drug acts upon the spinal cord before it involves the respiratory centre, for in several instances, it is recorded that the patient had recovered from a condition of complete paralysis. In my experiments on cats, rabbits, and dogs we found that the animal died from asphyxia before there was any great impairment of voluntary power.

Gelsemium has been highly praised in the treatment of cough, especially in "convulsive or spasmodic cough."

For practical purposes we recognise three different kinds of cough:—

1. Where the expectoration is free, and the cough is not in excess of the expectoration.

2. Where the expectorating power is diminished, as in emphysema and fibroid degeneration of the lung. In fibroid degeneration, owing to the great induration and thickening of the pleura, there is little or no expansion, and the air cannot be drawn into the small bronchial tubes behind the mucus, which is consequently not expelled. In these cases, although the expectoration is slight, the cough is often troublesome, and not infrequently very violent.

3. Where there is excessive excitability of the respiratory centre, and consequently a small secretion of mucus suffices to set up violent and frequent coughing.

In every case one object of treatment will be to diminish the secretion of the mucus in the bronchial tubes, and this method will have to be relied on chiefly in the first and second varieties. In the third, we must have recourse to the administration of sedatives, and here ether, chloroform, opium, and gelsemium will be found beneficial.

I have carefully watched for, but have been unable to detect in gelsemium, any influence on the mental faculties, though it has been employed as a mild narcotic. Patients, when under the influence of gelsemium, with drooping eyelids, look dull and heavy, and often feel sleepy, but when asked if they are conscious of any mental depression they always answer decidedly in the negative. Nor is cutaneous sensibility affected. I have tested sensibility roughly by pricking the skin and pinching, and also in two cases by the use of the compasses, but was unable to detect any loss of sensation, either in the face or forearm, although the patients to whom I am more especially referring had taken for six consecutive hours drachm doses of the tincture, and were fully under the influence of the drug. In respect of sensation I have been led to pay particular attention to the action of gelsemium on the gums from the success which has attended its administration in neuralgia of these parts, and though one patient, on the two occasions on which I experimented on him, did actually complain spontaneously of a "numb pain," and a little tenderness along the teeth and the edges of the gums of the upper jaw, yet I have never, in any case, been enabled to detect, either by pinching or by the use of sharp instruments, any loss of sensation in these parts.

In the doses in which I have employed it, gelsemium does not affect the temperature. To test this point, in addition to observations on patients, I made six temperature experiments on rabbits, but the latter results obtained were simply valueless, for I soon found—a fact with which I was previously acquainted—that in these animals fright exerts a marked influence on the temperature. The mere holding the animal's legs, or the placing it on its side with a view to introduce the thermometer into the rectum, will rapidly lower the temperature by as much as two degrees. My conclusions on the point in question have consequently been drawn entirely from observations on patients.

Strangely, the effect of an internal dose of gelsemium upon the eye is the opposite of that occasioned by its local application to the eye. When given by the mouth in doses sufficient to produce symptoms the drug, *in every instance but one*, caused contraction of the pupil indeed, in the case in which the drug produced weakness of the le with a strong double internal squint, the pupils were contracted t pin's point. In the exceptional case just referred to, the patient, whom I made two observations, though on each occasion complai of great giddiness, haziness, susceptibility to light, and diplopia not show contraction of the pupils ; these, however, manifested a unsteady condition, varying greatly in size, in rapid alternation without any apparent cause. In another patient the pupils cont strongly when exposed to light, but they dilated freely in a darkened room, and when they re-contracted on exposure to light they seemed to be in an unstable condition, oscillating a good deal. When the contraction of the pupil obtains it does not cease on the disappearance of diplopia or dimness; indeed, when the dimness passes away, the contraction of the pupil may increase.

In cases of accidental poisoning it has been reported that during complete general paralysis the pupils are widely dilated, whence it might be inferred that the condition of the pupil depends upon the dose—a moderate dose contracting, a very large one dilating, the pupil. This inference is possibly true in part, but the dilatation may, in these cases, be due in part also to the asphyxia, consequent on the larger dose. In confirmation of this Dr. O. Berger finds, and my observations confirm his statements, that dilatation of the pupils in poisoned animals occurs only when asphyxia from paralysis of respiration has set in, and that artificial respiration at once causes the pupils to contract.

On the other hand, the topical application to the eye dilates the pupil. In the first instance I employed a tincture (1 in 10) of the American liquid extract. These preparations, whilst dilating the pupil slightly, excited great irritation. Subsequently, I employed a solution of the alkaloid prepared by Mr. Gerrard—one grain in twenty minims of water; this caused scarcely any smarting. With this Mr. T. Fox and Mr. Sydney Pearse made nineteen observations for me. A few drops of the solution were put into one eye, and in each case this trial pupil became widely dilated, the dilatation usually beginning in about thirty minutes. Not only did the pupil dilate, but the muscle of accommodation became paralyzed and the sight affected; the vision again became nearly natural in twenty-four hours, but the pupil remained dilated much longer, sometimes, indeed, for a week, or even a fortnight.

The fact that the internal administration contracts the pupils led me to examine carefully whether the local application to the eye caused any primary contraction; in three instances I thought I detected a very slight contraction, which lasted only a few minutes.

The local application dilates the pupils of rabbits and cats, and the pupil of the latter being extremely sensitive, I thought that, if the local application did cause primary contraction, I should detect it best in this animal. This actually happened, for in five observations the pupil, in each instance, became decidedly contracted before dilating. In one instance the contraction began in two minutes, in another it was delayed fifteen minutes; the average time was ten minutes. The average duration of persistence was twenty-four minutes, and it was followed by wide dilatation.

I have said that the local application dilates the pupils, but I must add that in rabbits absorption sometimes takes place so readily, and these animals are so easily affected by the poison, that they become asphyxiated, and die before the pupil has time to dilate. The contracted pupils, due to the internal administration of the drug, and the dilated pupils, due to its local application, are both associated with dimness of sight.

I have said that the internal administration of gelsemium contracts the pupil in man and the lower animals, and that dilatation occurs only on the supervention of asphyxia, which at once disappears under the employment of artificial respiration, showing that the dilatation is due to the asphyxia and not to the drug. It occurred to me, therefore, that the internal administration itself would probably dilate the pupil, if it were not that a dose adequate to produce this effect paralyzes the respiratory centre so quickly that, before the drug has time to effect dilatation, the animal dies asphyxiated. To ascertain the validity of this conjecture I made a rabbit insensible with seven grains of chloral, then inserted a canula into its trachea, and injected into the subcutaneous tissues of the axilla thirty drops of the liquid extract, and at once commenced artificial respiration to prevent the advent of any asphyxia. In seventeen minutes I thought the pupils were a little contracted; in twenty-six minutes well-marked signs of paralysis set in, shown at first by a difficulty in keeping up the head; in half an hour the animal could not raise its head off the table, whilst it still retained considerable power over its trunk and extremities. At this point the eyes became prominent and the pupils began to dilate, and in thirty-four minutes the animal tumbled over on to its side, and I then noticed that the pupils were decidedly larger, and the eyes more prominent. As at the expiration of an hour the pupil had not become widely dilated, I repeated the thirty minims of liquid extract, injecting it in two places into the subcutaneous tissue. The paralysis now increased rapidly, till it became complete in the anterior part of the body, though the rabbit still had considerable power over its hind legs; but at last these also became almost completely paralyzed, and the animal lay on its side in a helpless state. As the paralysis advanced the pupil dilated somewhat, till at last it became more than double its original size, though it never reached the degree of dilatation observable in man and in cats after the local application of the alkaloid. I noticed on this occasion that the animal retained the power of closing its eyes quickly and strongly, even after almost complete general paralysis, whence I conclude that the seventh, or some of its [illegible] ne of the last nerves to undergo paralysis in th [illegible] ng this experiment I noticed that the a [illegible] first and most severely paralyzed, for [illegible] almost helpless, the animal retained [illegible] posterior extremities; in the end these [illegible]

On another occasion I repeated t [illegible] artificial respiration for two hours and ten minutes. During this time I injected, under the skin, a drachm of the liquid extract three times, paralyzing the rabbit completely. At first the pupils became slightly contracted, but under the full effect of the drug they dilated slightly. This experiment shows clearly that the internal administration of a large dose will dilate the pupil, though not considerably.

To sum up the effects of gelsemium, it has very little effect on the brain beyond inducing some drowsiness. It tetanizes and paralyzes by its action on the spinal cord. It paralyzes the respiratory centre; it paralyzes the peripheral parts probably of some branches of the oculo-motor nerve. It slightly depresses the heart by its direct action.

I have tried gelsemium with decided success in several cases of neuralgia of the dental nerves, even when the teeth were carious. Unfortunately, in several cases, the dose necessary to relieve the pain has produced much giddiness, haziness, and sometimes sleepiness, a considerable drawback. In some instances ten minims three times a day produced these toxic symptoms. To a girl of fourteen, suffering from neuralgia of the supra-orbital branch of the fifth, I gave three minims of the tincture three times a day, and produced by each dose complete ptosis of the neuralgic eye, lasting an hour or longer.

Whitla speaks of gelsemium as "one of the best remedies which we possess when the affection (neuralgia) is confined to the dental branches of the fifth nerve. . . . It must be given in doses bordering on the dangerous in some cases, . . . The B.P. dose of two grains (of the alcoholic extract) is dangerous. . . . As a rule it is well not to exceed the dose of one grain of the extract or twenty minims of the tincture until the patient has taken the drug for some time. These doses may be repeated at intervals of two hours till a painful feeling is experienced in the brows and eyeballs, followed by giddiness and some ptosis. As a rule it is not safe to push the drug after ptosis has been noticed, or when the patient complains of double sight, or when the least staggering of his gait has been observed" (*Dictionary of Treatment*).

I have found the tincture of gelsemium in ten-minim dose, thrice daily, useful in some cases of Menière's disease. In five-drop dose repeated every quarter of an hour the tincture is said to be useful in gall-stones, and in one case in my experience it did, repeatedly, avert an attack. The patient may get relief within five minutes after the first dose.[1]

It has been employed in tetanus, and in mania with sleeplessness.

It is highly spoken of in sleeplessness, especially in that of drunkards and in that arising from over-excitement.

It sometimes benefits asthma and spasmodic cough, *e.g.* the cough of pertussis and the nervous cough of hysterical subjects (Bartholow). It has also been recommended in pleuritis and pneumonia, in the same way, Whitla suggests, as we might employ aconite in the same affections. Dr. Bartholow advises in these latter affections that we should give 3–5 minims of the fluid extract "to maintain a constant effect within the limits of safety." (The fluid extract U.S.P. has a strength of 1 in 1 as against our tincture, which = 1 in 8.)

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[1] A tumbler or two of hot water with a teaspoonful of carbonate of soda is said to relieve the pain of gall-stones.

Gelsemium is useful in ovarian neuralgia and in dysmenorrhœa; also in many of the distressing symptoms occurring at the change of life.

It is clear that, in whatever affections we administer gelsemium, we must always keep clearly before us the danger signals which should stay or limit our dosage.

GRINDELIA

This plant, of the N. O. Compositæ, has acquired a considerable reputation in America, where it is used as an antidote in poisoning by the Rhus toxicodendron, and as a remedy in asthma and in allied diseases.

Two species, Grindelia robusta and G. squarrosa, furnish the leaves and flowering tops which are employed therapeutically. These have a balsamic odour and a somewhat pungent acrid taste. The active principle appears to be an oleo-resin, but according to Rademaker (*See* Bartholow) an alkaloid is also present. In use there is an alcoholic pilular extract and a spirituous liquid extract.

After absorption grindelia slows the heart and respiration. Large doses dilate the pupil and cause sleep; in this stage the cutaneous sensibility and reflex movements are lessened. It causes some general paresis, and in fatal dose kills by paralyzing the muscles of respiration.

Locally, grindelia acts as a stimulant, and in the stomach excites a sensation of warmth; if too long continued, it may cause gastric uneasiness.

Elimination takes place by the kidneys chiefly, but also by the mucous membrane of the respiratory tract.

Grindelia is used principally in asthma and allied spasmodic affections of the breathing apparatus; but it is also used in whooping-cough and other spasmodic coughs.

It seems to have some influence over bronchitis in the later stages.

It is also used in chronic pyelitis and chronic cystitis.

Grindelia is employed in two ways. Some give it in three-grain dose of the extract, thrice daily, to prevent an asthmatic attack; others, to cut short an attack, give it in twenty to thirty-minim dose, of the liquid extract, every half hour, or hour, beginning at the very onset of the paroxysm.

The liquid extract should be administered in milk or in some mucilaginous or sugary liquid on account of the oleo-resin, which would else be separated on dilution.

Grindelia is also used as a fumigation; it is so employed in asthma, and follows: the plant is steeped in a saturated solution of nitre, dried, and th ignited, the fumes being inhaled. This, of course, is mixed therapy Bartholow).

BELLADONNA

CERTAIN animals, such as pigeons and rabbits, appear to be almost insusceptible to the influence of belladonna. Dr. Horatio Wood has shown that the local application of belladonna does not dilate the pupil of pigeons, which observation supplements Wharton Jones's, viz., that when administered internally to pigeons the drug has no effect on the eye. Stramonium and hyoscyamus, as well as belladonna, have very little action on pigeons, and with these substances, indeed, it is almost impossible to kill them. Two grains of atropine, administered hypodermically, are required to kill a pigeon, and Calmus found that fifteen grains were required to kill a rabbit. It is said that vegetable feeders, generally, are but little affected by belladonna, but that it is a powerful poison to flesh-eaters; this explains, it is asserted, the very slight effect of belladonna on horses and donkeys.

The several preparations of belladonna are in frequent use as external applications, and none other are so effective for the relief of pleurodynia and in the hyper-sensitiveness of the skin and irritability of the muscles of the chest in phthisis: the liniment or the plaster of belladonna answers best in these states. The liniment is in most cases to be preferred to the plaster, since it is stronger and cleaner; it should be rubbed over the tender and painful part, several times daily, according to the severity of the pain. Although, as a rule, the liniment is preferable, yet in certain cases of pleurodynia the constant application of the plaster gives more relief. The liniment of belladonna, or the ointment of atropine, is sometimes used in facial neuralgia.

Myalgia often yields to belladonna, although an opium preparation, such as the linimentum saponis to which opium has been added, will sometimes succeed better.

An attack of lumbago, having perhaps affected the whole lumbar region, often leaves behind it one painful spot, which may, however, distress the patient, only when the body is moved in one direction. This remnant of lumbago generally resists the usual methods of treatment, and is perhaps driven from one spot only to reappear at another, but a large belladonna plaster will generally relieve or altogether remove it.

The local application of the liniment or ointment of belladonna will often relieve, and sometimes even cure, neuralgia. Its efficacy is most manifest on the fifth nerve, as in neuralgia of the brow, or under the eye, accompanied by severe pains in the eyeball, and intolerance of light.

Sciatica will sometimes succumb to it.

Belladonna preparations are of further use as local applications. Thus, the extract, smeared over painful cracks in the mucous membrane, is employed to relieve the pain of fissure of the anus.

In almost all forms of inflammatory pain, especially if the inflammation be at or near the surface, belladonna preparations are useful. The most suitable application is the glycerine of belladonna, which is made thus :—One ounce of extract of belladonna, one drachm of hot water, and of glycerine sufficient to make two ounces. This pigment smeared thickly over the painful part, and then covered with lint or cotton wool, is most effective as a local sedative; in more acute cases, hot fomentations may be applied over the belladonna. This treatment serves not only to allay the pain, but also to modify and subdue the inflammation. Belladonna is effectual also in forms of inflammation which threaten to end in abscess. Thus Mr. Christopher Heath has shown that belladonna will prevent the formation of abscesses in the neck and elsewhere, and after the onset of suppuration will check pain and inflammation. The belladonna treatment of boils and carbuncles often succeeds. (*See* Sulphides and Poultices.)

Belladonna, employed either internally or externally, checks, and even suppresses, the secretion of certain glands. This is true of the mammary, sudoriparous, and salivary glands, and, possibly, of other glands also. Belladonna, it is well known, will arrest the secretion of milk, and is employed with great advantage when, from any cause (the mother being unable to suckle her child) the breasts become swollen, exquisitely painful, and threaten to inflame and suppurate, unless the tension of the ducts is relieved. If, in such case, the milk cannot be drawn off artificially, the secretion must be suppressed by means of belladonna, which should be applied early, before inflammation has set in. If this be done, the swollen, painful breast will gradually diminish in size, and within a few hours may become soft, comfortable, and painless. But, even if inflammation has set in, and the breasts have become tense, shiny, hard, knotty, red, and acutely painful, the continuous application of belladonna for twenty-four or forty-eight hours may still remove the inflammation and tension, and arrest the impending abscess. The rapid relief which this treatment gives in these cases will, indeed, greatly astonish any one unaccustomed to its use, and it should be employed in all cases, no matter how far the inflammation has advanced, for it will often arrest the progress of an inflammation, otherwise almost certain to suppurate. Even should it fail to prevent suppuration, it will reduce inflammation, subdue the pain, and greatly limit the inevitable abscess.

The liniment, the extract mixed with an equal quantity of glycerine, the ointment, or a drachm of the tincture to an ounce of olive oil, or, again, two drachms of the liniment mixed with an ounce of lard, one or other of these preparations should be smeared or lightly rubbed over the whole breast, but especially over the areola around the nipple. The liniment is speedily effectual, but, upon the whole, the glycerine of belladonna is perhaps the most satisfactory.

Frequent fomentations with very hot water, unless cooler water should be found more agreeable and soothing, form an excellent adjunct, but the nurse must be cautioned to wipe the skin perfectly dry before applying the belladonna, or friction with, say, the liniment may produce a sore.

Dr. Gabb, of Hastings, tells me that he finds the combination of belladonna with the application of an ice bag most useful in threatened milk abscess. He smears the nipple and surrounding parts with extract of belladonna and glycerine, and covers the breast with an ice bag. The application of ice must be strictly continuous.

Belladonna will arrest not only the secretion of milk, but, also, the secretion of perspiration. A man forty-five years old had been troubled for many months with profuse sweating of the right side of the face and neck, which used to break out on the slightest exertion, or when near a fire, or if excited; the perspiration would run down his face and neck in streams, soaking the collar and the band of the shirt. His face would show neither redness nor injection, but the sweat had produced an abundant crop of miliary vesicles, strictly limited to one-half the face. The liniment of belladonna, applied two or three times a day, abated this excessive sweating considerably, and reduced it to little more than the natural amount.

The effect of belladonna in this instance led me to test its influence over other kinds of sweating, and I found that if used twice or thrice a day, the liniment will completely check the sweating that soaks the pillows and bedews the head and face of young children who have been sleeping. After a few days the application may be discontinued, and there will be no return of the perspiration. Again, many healthy adults are troubled all their lives with profuse sweating of the hands or feet, sometimes so copious as to run off in drops, and especially noticeable at the tips of the fingers, and the ball of the thumb. Belladonna liniment rubbed into the hands three or four times a day will often, in time, diminish and sometimes completely arrest this annoying affection, although, no doubt, there are cases in which the treatment fails. The sweating may, at any rate, be arrested for a considerable time, and sometimes the good effects are permanent.

Since the publication of the foregoing remarks I have made many fresh observations, which confirm the efficacy of belladonna in checking sweating. Thus, a patient, who all her life had suffered from profuse sweating of the left side of the body, was able to completely check the sweating by rubbing belladonna ointment into the face twice or three times a day. Again, in cases of local sweating of the loins, affecting, may be, a surface a little larger than the hand, belladonna has checked the perspiration, and likewise cured the eczema which had been excited.

Many experiments of the following kind have likewise been instituted. On several occasions a patient, after undergoing a sweating in the hot-air bath, has been rubbed with belladonna ointment on one side of the face for a quarter of an hour, three times a day, for two or three days in succession. The bath of the same temperature and duration has then been repeated, and the sweating, both during the bath and after, has been very greatly lessened; moreover, the effect has been general, although the ointment will have been applied only to one side of the face. In some cases the ointment was rubbed into the chest, but the effects were much less marked than when applied to the face, possibly because less ointment was absorbed by the thicker skin of the chest.

Inasmuch as the local application checked sweating over the whole body, it was argued that it acted probably by absorption, and this led to the internal administration of belladonna. The repressive effect, however, was apparently less than when locally applied, possibly because in the cases in point the amount of the drug swallowed was less than that absorbed by the skin. The internal administration of belladonna does, however, effectually control sweating, and particularly in the case of weakly children perspiring profusely after exertion, or whilst sleeping. In the curious case of a middle-aged man, who, after much mental worry, suffered from excessive sweating of both cheeks, coming on while eating (the tendency being promoted by hot meat or vinegar) but ceasing immediately after the meal, ten drops of tincture of belladonna, thrice daily, checked the sweating completely. This man passed, at times, a profuse quantity of pale urine.

Employed hypodermically, atropine checks sweating promptly. After repeated experiments, I find that during the profuse sweating produced by the hot chamber of the Turkish bath, one hundredth or one two-hundredth of a grain of atropine will, in a few seconds, completely dry the skin, and maintain it dry, notwithstanding the continuance of the bath. These experiments led me to employ belladonna hypodermically in the sweating of phthisis, and other exhausting diseases, and I found that one hundredth, or even one two-hundredth of a grain, would generally arrest the sweating, sometimes for more than one night, and that in phthisis it made the patient sleep better, and quieted the cough. Dr. Murrell made, at my request, sixty experiments on phthisical patients, and he found that the drug was equally successful in men and women, in febrile and non-febrile cases, in the prostrate and comparatively strong, but that it failed in about 8 to 10 per cent. Sometimes its effects are delayed: thus, if administered at bedtime, it may not check sweating till the following night; or its beneficial influence may extend over several nights, and then gradually wear off, each night the perspiration returning a little earlier. In a few cases it permanently checks the sweating. This treatment, unfortunately, produces a disagreeable dryness of the throat, but since many phthisical patients suffer already in this way, the slight aggravation of the dryness is scarcely noticeable. Atropine may be given as a pill in one-fiftieth to one-seventieth of a grain.

Belladonna checks the secretion of the abundant foul-smelling sweat from the feet, which is, occasionally, a very troublesome symptom. Thus we meet with cases where the soles of the feet are very tender, and the skin peels off in large flakes, leaving the dermis very red; this condition, which is accompanied by much sweating of the feet, and is probably produced by the sweating, is apt to persist for years, but may, in some cases, be cured in ten days or a fortnight by the local application of belladonna night and morning. In making the liniment, for this purpose, eau de Cologne may be used instead of simple spirit.

In checking sweating about the head and face too much liniment should not be applied at one time, lest, by absorption, it dilate the pupil and obscure the sight.

In the cases just described it was experimentally proved that the effects were due to the belladonna and not to the spirit.

Belladonna checks salivary secretion, and induces dryness of the mouth and throat.

The salivary glands are supplied by nerve fibres derived from the seventh; these which proceed to the submaxillary gland running in the chorda tympani nerve. Through this nerve the submaxillary gland is stimulated to secretion. Thus, if an acid is placed on the tongue, the secretion from this gland becomes abundant, but if the chorda tympani nerve is divided, acids applied to the tongue or mucous membrane of the mouth fail to produce this secretion. If the distal end is electrically stimulated, we produce the same effects as we obtain by the application of an acid to the mouth; *e.g.*, we cause the arteries leading to the submaxillary gland to enlarge, and the blood to pass so quickly through the gland that its veins pulsate and become filled with arterial blood, whilst at the same time an abundant secretion pours from the gland. If atropia is given to the animal, neither acids introduced into the mouth nor stimulation of the chorda tympani will excite submaxillary secretion. How is this arrest produced? Does the belladonna prevent the flow of a sufficient supply of blood to the gland and so arrest secretion? This view, formerly accepted, is now held to be erroneous, for though atropia will diminish the blood-supply, still, if the chorda tympani nerve is stimulated, the vessels will dilate, and abundant blood be sent to the gland without augmenting the secretion. The action of atropine, therefore, is not due to its paralyzing effect on the vaso-dilator fibres of the chorda tympani, and it is inferred that this nerve must contain other fibres distributed to the cells of the gland—in fact, secretory fibres, and that belladonna paralyzes these fibres of the chorda tympani. I would point out that atropine may possibly act directly on the gland cells, this hypothesis explaining the foregoing facts as satisfactorily as does the assumption of the existence of secretory fibres.

Experiments indicate the existence of sweat centres. Luchsinger believes that these centres are situated in the lumbar and the lower part of the dorsal region of the spinal cord. Nawrocki believes that the medulla contains a sweat centre. It has been demonstrated by Luchsinger and Ostrumoff that the sweat fibres run with the vaso-motor fibres. Luchsinger and Nawrocki show that pilocarpine and atropine affect the sweat production by their action on the periphery of the sweat apparatus, and perhaps by an action on the centres as well. Dr. Ott and Mr. W. Field have also shown that muscarin excites sweating by its action on the peripheral sweat apparatus. Belladonna, as we have just seen, affects the salivary secretion by its action on the peripheral part of the secretory nerves, and now in respect of the cutaneous secretion it is further proved that atropine, pilocarpine, and muscarine act on the same part of the sweat nerves.

Dr. Cook has recently reported cases of salivation from mercury and scurvy, cured by the hypodermic injection of atropia.

Recollecting that in acne there is over-abundant secretion from the sebaceous follicles, I have been induced to use belladonna in the hope of checking it, and in fact this treatment has seemed to me to be of some slight service.

The extract in conjunction with tannin, in the proportion of one or two grains of extract to six or eight of tannin, is recommended by Trousseau in leucorrhœa with ulceration of the os uteri, and in neuralgia of the uterus. In the former belladonna arrests the too abundant secretion from the mucous glands, its action in this respect being assisted by the tannin; in both affections belladonna is serviceable as a means of relieving pain. The mixture of belladonna and tannin may be wrapped in cotton-wool, or made into a bolus with cocoa-nut fat, and placed in contact with the painful and over-secreting os. Some obstinate forms of leucorrhœa yield completely to this treatment.

When the disease depends on a too free secretion of the mucous glands about the os uteri, and when this condition is associated with much pain, the following injection yields good results:—bicarbonate of soda, a drachm; tincture of belladonna, two ounces; water, a pint. The syringe should be introduced as far as possible, while the patient lies on her back, with the buttocks raised by a pillow, while one or two syringefuls, used cold, should be injected into the vagina, and made to reach the mouth of the uterus. The dorsal position should be maintained for a few minutes, so as to allow the wash to remain in contact with the os uteri.

Among the most important local actions of belladonna we have the effects upon the eye:—dropped into the conjunctival sac, or applied to the surrounding skin, or introduced into the stomach, preparations of belladonna produce very speedily extreme dilatation of the pupil. This dilatation is one of the most characteristic symptoms of belladonna. The dilatation of the pupil is attended by paralysis of the muscle of accommodation and by rise of intra-ocular tension. The balance of evidence favours the view that the pupil effects are the result of a paralysis of the terminal filaments of the oculo-motor nerve, associated, probably, with a stimulation of the endings of the sympathetic, the latter causing some active dilatation. On this view the widening of the pupil will be partly passive, partly active. It seems possible also that the pupil effect is a local one, and that when belladonna acts upon the eye after internal administration it does so by being carried in the blood stream to the eye and there acting (consult H. C. Wood, *Therapeutics*). Luchsinger finds that atropia paralyses smooth muscular fibre, but not striped muscular fibre; hence it does not affect the striped muscular fibres of the irides of birds and reptiles. In iritis, and some other eye diseases, solutions of atropia are used to produce dilatation of the pupil, and to break down adhesions. It is much used to prepare the eye for ophthalmoscopic examination, and estimate refractions. In conjunctivitis, and other *superficial* inflammations of the eye, belladonna is employed both locally and internally.[1]

Passing now to the action of belladonna upon the alimentary tract, we note first that a full dose of belladonna produces great dryness of the tongue and roof of the mouth, the dryness extending down the pharynx and larynx, and inducing, consequently, some difficulty in swallowing, together with hoarseness, and even dry cough; a large dose will sometimes induce dryness of the Schneiderian membrane, and sometimes dryness and much injection of the conjunctiva. Harley produced ophthalmia in a dog by belladonna.

"After about two hours," says Dr. J. Harley, "the dryness of the mouth gives way, to be replaced by a viscid, sticky, acid, and foul-smelling secretion, and the mucous membrane becomes clammy, and the tongue is covered with a white fur." Several of these symptoms indicate the influence of belladonna in arresting secretion, of which mention has already been made.

In several instances of disease, on the other hand, Harley has known belladonna to cleanse and moisten the tongue, *e.g.* in typhus fever patients. Belladonna is also employed in several inflammatory affections of the throat, its good effects being most apparent when the throat and tonsils are acutely inflamed and swollen. It may be given in combination with aconite, but the influence of aconite on this form of inflamed throat, provided that the pulse is full, and the skin hot and dry, exceeds that of belladonna.

The influence of belladonna on digestion is not known.

It is not yet satisfactorily ascertained in what way belladonna affects the intestines; but, bearing in mind its influence on the lining membrane of the mouth, it may be conjectured that belladonna lessens the secretion of the intestinal canal. It has been asserted by some that belladonna increases the peristaltic movements of this canal, but others insist that, whether given in small or large doses, belladonna weakens the peristaltic contractions. Yet others assert that in small doses it increases peristalsis, but that in large doses it paralyzes the muscular coat of the intestine; they maintain, indeed, that belladonna affects all unstriped muscular fibre in this twofold way.

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[1] With any suspicion of glaucoma we shall not use it.

It has been experimentally proved that the drug paralyzes the terminations of the inhibitory fibres of the splanchnics distributed to the intestines, for, whilst stimulation of the splanchnics will stop intestinal movement, small doses of atropia will prevent this arrest.

Trousseau recommended belladonna in obstinate constipation, and no doubt, in many instances, it does succeed admirably. He advised doses beginning at one-sixth to one-fourth of a grain of the extract to be taken once a day, either night or morning, and gradually increased till ultimately four or five pills, each containing the above dose, were taken at a single dose; when the constipation was removed, the medicine would be diminished or discontinued. Dr. Nunneley finds this treatment useful in all forms of constipation, especially when coexisting with dyspepsia, and characterized by a thinly-furred tongue, with prominent red papillæ at the tip, epigastric tenderness, pain after food, and, often, more or less headache; it ensures a natural evacuation daily. The treatment must be continued a fortnight or three weeks. The late Mr. Foster, of Huntingdon, employed a small dose of belladonna to prevent the constipating effects of iron. In some of the severest cases of constipation where powerful purgatives have failed, a suppository containing one or two grains of the extract has opened the bowels.

Belladonna often relieves colic of the intestines, and is especially serviceable in the colic of children.

That the active principle of belladonna is readily absorbed into the blood is proved by the symptoms. After a considerable dose of belladonna, the face becomes much flushed; the eye bright, dry, and injected; the pupil dilated; the sight dim and hazy; while the power of accommodation in the eye, for instance, is lost. The mind and senses are peculiarly affected. The ideas, at first rapid and connected, become incoherent and extravagant, and there is often decided delirium, with pleasing illusions. Sometimes the patient is seized with restlessness, keeps continually moving, and cannot be quieted. A kind of somnambulism is occasionally observed, and cases are recorded in which, under the influence of belladonna, the patient will for long periods perform the movements customary to his occupation; it is narrated of a tailor that he would sit for hours moving his hands and arms as if sewing, and his lips as if talking.

The delirium may be furious and dangerous, requiring restraint; nay, it is recorded of a man poisoned by this drug, that so violent did he become that he was ordered to be confined in a mad-house. Sometimes a very small dose will induce mental disturbance, and so great is the susceptibility of some people that, even when applied to the skin in the form of the plaster or ointment, belladonna will induce marked cerebral disorder.

It is evident then that belladonna affects the cerebrum. Albertoni has proved experimentally, however, that it has no influence on the motor centres.

Belladonna weakens the muscular power, renders the gait unsteady and staggering, so that a patient, having lost control over his movements, may run against objects which he sees, yet desires to avoid.

This loss of power is due not to the action on the muscles, but to the action of atropine on the motor nerves, atropine paralyzing both the terminations and the trunks of the motor nerves.

Some experiments which I made with the assistance of Dr. Murrell have convinced us, however, that some of this paralysis is due to the depressing effect of the drug on the spinal cord.

Atropine affects the cord and may excite tetanus, an effect long undetected, till it was pointed out by Dr. Fraser.

Dr. Fraser has shown (1) that in frogs tetanic symptoms follow the subcutaneous injection of a dose of sulphate of atropine equivalent to about 1,000th of the weight of the animal; (2) that this tetanus sometimes sets in on the second day, but more frequently on the third, fourth, or fifth; (3) that it varies in its duration from a few hours to seventeen days; (4) that it is due to the action of the drug on the cord (*medulla oblongata* and *medulla spinalis*).

In conjunction with Dr. Murrell I made some experiments on this subject. Our observations were made during the months of May, June, and July. The frogs used for the experiments were, with a few exceptions, the ordinary *Rana temporaria*. We employed, except when the contrary is stated, a 1 in 20 solution of sulphate of atropine in water, the requisite dose being injected either under the skin of the back or into the axilla. The first twelve cases were observed thrice daily, between seven and eight in the morning, one and two in the afternoon, and five and six in the evening. In the subsequent experiments observations were made much more frequently, with the view of determining how rapidly paralysis occurred, how soon it reached its height, and how quickly it declined. In some cases the animal was under almost continuous observation for many hours, in others the notes were taken every eight or ten minutes for the first hour, and hourly for every three hours subsequently. We may take this opportunity of explaining that whenever we employ the term "pithed and pegged," we mean division of the cord by cutting, and destruction of the brain by the introduction of a piece of wood into the cranial cavity. Like Dr. Fraser, we often obtained strong tetanus from the subcutaneous injection of atropine, but found that his dose (from $\frac{1}{131}$ to $\frac{1}{1250}$ of the weight of the frog), usually killed our animals instead of producing the desired result. With a smaller dose, however, namely, from $\frac{1}{1500}$ to $\frac{1}{2000}$, we were more successful. In our experiments the tetanus commenced earlier than in Dr. Fraser's, our average period of onset being twenty hours. In one case it was well marked in three hours, whilst in the longest it was delayed twenty-eight hours. With us, also, it lasted for a shorter time than th recorded by Fraser, for in one animal it continued only eight hou never, in any instance, did it exceed five days. We imagine th differences must be due to the time of the year at which the o were made.

Why is the tetanus so long delayed after atropine poisonin referring to Dr. Fraser's paper, says that the paralysis of the motor nerves prevents the tetanic condition of the cord from displaying itself on the muscles, but Dr. Fraser himself nowhere makes this assertion, and, indeed, his cases prove the contrary.

This proffered explanation we hold to be erroneous, for the following reasons:—

I. Bezold and Blœbaum have shown that even with very large doses it is difficult to destroy completely the conducting power of the motor nerves, and it is obvious that as long as their conductivity is in the smallest degree retained the tetanic condition of the cord must produce more or less tetanus of the muscles.

II. The onset of tetanus is delayed even in cases in which the dose of atropine is so small as to produce but slight paralysis, and it must be admitted that if the motor nerves are capable of conveying voluntary and normal reflex impressions they should conduct tetanic stimuli. In many of Fraser's cases, there was never complete loss of reflex and voluntary power during the period which elapsed between the injection of the drug and the onset of tetanus. Thus it will be found that, of the cases in which he obtained tetanus, there were twelve in which the paralysis was incomplete, and that in seven of the thirteen in which it had been complete a partial recovery of reflex and voluntary power had taken place for a day or more before the onset of tetanus. In eleven of our own twenty-six cases there was incomplete paralysis of reflex action and voluntary power, and in all these cases the onset of tetanus was delayed; in two cases, moreover, both voluntary and reflex power had been completely regained before the tetanus set in. In one case, in which there had been complete paralysis, this began to improve five and a half hours before the commencement of the tetanus

III. If the poison be prevented from having access to certain limited regions by ligature of the supplying vessels, the onset of tetanus will still be delayed even in these protected parts. Fraser gives an account of four experiments, in which he adopted this mode of procedure. In three, before poisoning the animal, he tied the femoral vessels, and in one the abdominal aorta, and yet tetanus did not occur in the protected limbs till twenty-two hours, fifty-one hours, three days, and twenty-two hours respectively.

We have tested the action of atropine on ten pithed and pegged frogs, in which before poisoning the abdominal aorta was tied. The following was our mode of procedure:—We first divided the medulla by cutting through the occipito-atlantal membrane, and then passed a pointed wooden peg upwards through the foramen magnum into the skull, so as to destroy the brain; we then tied the abdominal aorta just above its bifurcation. In three cases in which we obtained tetanus it was delayed for twenty-five, nine, and four and a half hours respectively.

We conclude, then, for these reasons, that the late occurrence of tetanus in atropia poisoning is not due to paralysis of the motor nerves, but that it is owing to a slow action upon the cord. It appears, indeed, that whilst the poison paralyzes quickly, it takes many hours, nay, even days, before it tetanizes.

Accepting this it has been suggested that this delayed tetanus, which often sets in from the third to the fifth day, cannot be due directly to the atropia, but must depend on some products slowly formed within the body by or from the atropine.

note next that the afferent nerves are

tropine.

Most observers state that atropine produces severe pain in the head, located generally over the forehead, and in the eyes, sometimes over the top of the head. Singing in the ears is also liable to occur, with more or less giddiness.

In persons poisoned by this plant a scarlet rash often breaks out on the skin, a rash said to be like that of scarlet fever, and to be most marked in the neighbourhood of the joints. Mr. J. G. Wilson reports a case in which the local application of belladonna produced a general red rash, with redness of the throat and dilated pupils.

Spasmodic contraction of the sphincter of the bladder has been observed not unfrequently in belladonna poisoning.

The first effect of belladonna on the pulse is to increase its frequency, fulness, and force, to the extent even of fifty to sixty beats in the minute;[1] moderate doses at the same time increase the blood-pressure, probably by an influence on the vaso-motor centre. Under large doses arterial pressure falls, from direct paralysis of the muscular coat of the blood-vessels. The condition of the circulation continues till the tongue and mouth become moist and clammy, when the pulse diminishes in frequency, and loses strength (J. Harley). In fatal cases the pulse grows rapid, intermittent and weak. Dr. J. Harley considers belladonna a powerful heart tonic, and he points out that it serves to reduce the frequency and to strengthen the beats of the heart when weakened by disease.

Atropia paralyzes the terminations of the vagi, for in animals poisoned by atropia neither section nor galvanization of the vagi affects the heart. When injected into the carotid, so as to reach the central nervous system before the nerves, atropia first reduces the number of the heart's beats, showing that it stimulates the vagal nucleus; subsequently it paralyzes the terminations of the vagi.

It would appear that it is not exactly the terminations of the vagi, which are paralyzed by atropia, but an intracardiac inhibitory apparatus. For whilst after poisoning by curare, stimulation of the vagi has no effect on the heart, this is at once arrested by the application of the electrodes to the sinus of the heart; curare, indeed, paralyzing the terminations of the vagi, but leaving unaffected an inhibitory apparatus in the heart itself. After poisoning by atropia, on the other hand, neither stimulation of the vagi nor of the sinus affects the heart, whence it is concluded that atropia paralyzes the intracardiac inhibitory apparatus.

Atropia is considered to stimulate the cardiac accelerator nerve.

Both reasoning and experiment led Mr. Schäfer, Professor of Physiology at University College, to recommend the use of atropia during the inhalation of chloroform. The chief source of danger during the use of chloroform is its depressing action on the heart, the heart, in many fatal cases, suddenly ceasing to beat. This action, Mr. Schäfer believes, is due, in some cases, to the chloroform stimulating the inhibitory cardiac apparatus; in some others, doubtless, the sudden death is due to the effect of the operation on the nervous system. Thus, it is well known, that when the leg of a frog is crushed, the heart stops, but that division of the vagi prevents this stoppage. Now Schäfer argues that a dose of atropia, sufficient to quicken the pulse, *i.e.*, to paralyze the inhibitory cardiac apparatus, will prevent the arrest of the heart by chloroform or shock.

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[1] Dr. Nunneley asserts that in the frog belladonna neither increases the frequency of the heart's beats nor dilates the pupil, and this statement has been abundantly corroborated in respect to its action on the heart, showing that belladonna must affect the frog otherwise than man and some animals, such as the dog, the horse, etc.

To briefly sum up the action of atropine, we find that:—

1. It tetanizes the cord and heightens its reflex functions;
2. It stimulates the respiratory centre and the inhibitory centre of the heart;
3. It stimulates the cardiac accelerator nerve or its centre;
4. It stimulates the vaso-motor centre, and so heightens arterial pressure;
5. It paralyzes the motor nerves, first affecting the trunk;
6. It paralyzes the terminations of the vagi in the heart;
7. It paralyzes the terminations of the secretory nerves of the salivary glands, and those of the sweat glands;
8. It paralyzes the terminations of the inhibitory fibres of the splanchnics;
9. Large doses depress slightly the functions of the afferent nerves;
10. It paralyzes the terminations of the oculo-motor nerves, and stimulates the sympathetic (so far as the iris itself is concerned).

It appears then, that whilst to a large part of the central nervous system it acts as a "stimulant," to many of the nerves it operates as a paralyzant.

The influence of belladonna on the sympathetic led Dr. R. T. Smith to employ it in two cases of exophthalmic goitre—a disease regarded by some as due to paralysis of the sympathetic of the neck. The effects were striking. Five minims of the tincture hourly afforded great relief within four or five days, though the disease had lasted for more than a year. In two months the exophthalmos had much lessened. Amongst many others Dr. Wilks advocates the use of belladonna in exophthalmic goitre, he orders it in doses of ½ grain of the extract thrice daily, interrupting the prolonged use of belladonna by short intervals of rest. Dr. Wilks thinks that the disease may exist without either exophthalmos or goitre, and he treats tachycardia with perspiring skin on the same lines, holding that these are manifestations of the same affection. Homœopathic doctors have long employed this treatment.

Trousseau has employed belladonna successfully in epilepsy, according to the following method:—"During the first month of treatment the patient takes a pill, composed of extract of belladonna and powdered leaves of belladonna (of each one-fifth part of a grain); this he takes every day, if the attacks occur chiefly in the daytime, or in the evening if they are chiefly nocturnal. One pill is added to the dose every month, and, whatever be the dose, it is always taken at the same period of the day. By this means the patient may reach the dose of from five to twenty pills, and even more." The dose is to be regulated by circumstances. This treatment, it is said, yields much relief, even when it fails to cure.

Belladonna often allays both the cough and oppressed breathing of asthma. To ensure success it must be employed in considerable dose, as Dr. H. Salter pointed out, and I have often verified. Ten minims of the tincture every two or three hours, a quantity generally well borne, is often sufficient; but, if any of the undesired symptoms of belladonna set in, the dose must be reduced. If the patient is not very susceptible to the action of the drug, far larger doses may be required; thus, on occasion half a drachm of the tincture, hourly, will be well and advantageously borne. Such doses need only be taken at the time of the paroxysm, but this may last several days, and the medicine should then be given in the quantity recommended till an impression has been made on the disease. The effect will be found chiefly satisfactory in either averting the attack or in rendering it milder.

Belladonna is one of the best remedies in whooping-cough; but, to obtain any good from it, it must be employed in considerable doses as in asthma. To children two and three years old I have often given as much as ten minims of the tincture every hour, and this quantity produces usually no toxic effect, neither dilating the pupil, nor, so far as one can judge in children so young, making the throat dry; it certainly does not do so in children a little older, who are able to express their feelings.

Should drowsiness, delirium, or dilatation of the pupil occur, the dose, of course, must be diminished. The only symptoms which I have witnessed from these large doses is dilatation of the pupil. Children, it is well known, bear belladonna much better than adults. Some writers state that children become rapidly accustomed to belladonna, but these large doses may be given from the first, and, in the course of many cases, I have never had to give less on account of any toxic effects produced. These doses will often reduce much the severity and frequency of the cough, even during the period when it is most violent and convulsive, but, like all other remedies for this di
belladonna is of little use if the patient is exposed to cold an
winds. If, therefore, the weather is cold the child should
to the house and to a warm room; if, on the contrary,

mild, out-door exercise will be highly beneficial: cold in every case must be most carefully avoided.

While there can be no reasonable doubt of the great efficacy of belladonna in many cases of whooping-cough, it must be admitted that in many instances, without apparent reason, it fails. Influences, at present not understood, appear to modify its effects; for in some epidemics it is very successful, while in others it appears to be inoperative. Belladonna exerts but little effect on whooping-cough when bronchitis, or any local irritation exists, such as that caused by teething, worms, etc. Accordingly if the gums are red, swollen, and painful, they must be freely lanced, and other sources of irritation removed. Belladonna is considered of especial use in the third week of the attack—at a time, that is, when the febrile stage has passed away, and the violence of the convulsive attacks is declining.

Belladonna is often useful in other coughs, although with our limited knowledge on this subject it is impossible to lay down precise rules for its employment.

Belladonna is often used to relieve pain. Dr. Anstie considers it the best remedy to mitigate every kind of pain in the pelvic viscera.

Some neuralgias, no doubt, yield to this medicine; it appears to possess most efficacy over neuralgia referable to the fifth nerve. Cases are recorded of relief afforded by it in sciatica.

Trousseau recommended the following method of treating neuralgia:—To administer one-fifth part of a grain every hour till giddiness was produced, and then to lessen the dose; the medicine to be continued, however, for several days.

It is often useful in certain forms of headache—for instance, when the pain is situated over the brows and in the eye-balls, which seem as if too large for the head, and as if they would be forced out of the skull. These headaches are not due to stomach or uterine derangements; indeed, very often their cause cannot be discovered. They are especially prone to affect young women, and they seem to be due to weakness and overwork. Three minims of the tincture should be given every three hours.

It is said that belladonna controls the delirium of fevers, *e.g.* of typhus fever.

Dr. John Harley found belladonna useful in typhus fever; it slowed and strengthened the pulse, reduced the temperature, moistened the tongue, and, he thought, shortened the course of the disease. Its prolonged use, however, makes the heart irritable.

Belladonna has been recommended as a preventive of scarlet fever, but so much prejudice has been introduced into the discussion of this question that it is difficult to conclude whether it has any prophylactic virtues.

externally, is certainly efficacious in
be given in combination with

aconite, but when the skin is hot and pungent, and the pulse is firm and resistant, aconite exerts over this inflammation an influence far more potent than that of belladonna.

Belladonna is both speedier and more certain than any other remedy in removing that troublesome affection, incontinence of urine. It must be given in doses of from ten, twenty, to thirty drops of the tincture three times a day; small doses often fail when large ones succeed at once. It may take a fortnight to succeed. Sometimes the incontinence is not limited to the night, but may trouble the child during the day. These severe forms will often yield to belladonna, but while in some cases it is thus effectual, it not infrequently fails altogether, although no worms infest the intestines, nor other irritation exists about the rectum, and no reason is obvious to account for its failure. Strychnine, cantharides, turpentine, santonine, or galvanism, should then be tried. In nocturnal incontinence the child should drink but little for some hours before going to bed, and he should be waked in the middle of the night to pass water.

Belladonna sometimes checks the incontinence of urine of the old or paralytic.

Belladonna has been found of service in the treatment of nocturnal seminal emissions; a grain and a half of sulphate of zinc with a quarter of a grain of extract of belladonna, three or four times a day, is often a successful remedy in these cases.

Atropia is antagonistic to *opium*, *Calabar bean*, *muscarin*, *jaborandi*, *bromal*, *aconite*, and *prussic acid*.

As belladonna and *opium* are in some respects mutually opposed in their action, as, *e.g.* on the eye, etc., it has been assumed that they must be opposed in every particular, and that one is the antidote to the other. Many cases of opium poisoning are adduced, where the symptoms, although very serious, were apparently removed by belladonna, and *vice versâ*. Dr. Erlenmeyer is of opinion that, in respect to their action on the brain, these agents are antagonistic, and that no coma will result when they are administered conjointly, but that they exercise no mutual counteractive influence on the sensory nerves, and hence he recommends them in combination to relieve pain. On the other hand, some authorities, among whom may be named Brown-Séquard and J. Harley, dispute this antagonism, on the ground that the cases cited are insufficient to prove it, and that it has not been observed in experiments on the lower animals or on man. It must be remembered, however, that these drugs do not affect similarly animals and man. The reported cases in favour of this antagonism have been severely criticized by Harley, who points out that many of them were treated by other remedies besides belladonna; that in others a fatal dose is not proved to have been taken; and that the patients who recovered did not improve sooner than they would have if no belladonna had been administered. Harley concludes, and in most respects he is directly opposed to Erlenmeyer :—"(1) That in medicinal doses the essential effect of morphia (hypnosis) is both increased and prolonged by the action of atropia, whether introduced previously or at any time during the operation of the former. (2) That atropia relieves, and if given simultaneously, or previously, prevents the nausea, vomiting, syncope, and insomnia which frequently result from the action of opium. (3) That in a sufficient proportion (for most individuals, one forty-eighth part of a grain of sulph. atropia to a quarter of a grain of acetate of morphia) atropia neutralizes the contractile effect of opium on the pupils ; but that in larger doses dilatation takes place as if no morphia had been given. It is also to be observed that if the quantivalent doses are *successfully* introduced the drug last administered exhibits for a short time a counteracting effect. (4) That all the other effects of atropia are intensified and prolonged by the action of morphia, induced previously or at any time during the operation of the former. If, however, the dose of atropia be small, and the morphia produce considerable deranging effects on the vagus, the rapidity of the pulse is not greater than when the atropia is administered alone." Had Harley given opium in a dose just sufficient to destroy life, and had death ensued after the employment of belladonna, he would have proved that belladonna would not arrest the fatal effects of opium, and *vice versâ.* In no reported instance, however, did he use enough of either drug to destroy life, and hence his observations are not so convincing as they might have been ; still, as belladonna intensified the coma from opium, his observations are valuable.

On the other hand, Dr. Johnson, of Shanghai, who, during his residence in China, had striking experience of opium poisoning, having treated in various ways upwards of 300 cases, speaks in the strongest terms of the antagonism between opium and belladonna. It is, he says, in the worst cases of poisoning that atropia displays its wonderful effects, for instance, where the immovable pupils are contracted to a pin's point, the conjunctiva insensible to touch, the face pale, the lips, eyelids, and nails livid, the pulse weak and irregular, the breathing slow and stertorous, the extremities cold ; here within ten or twenty minutes after the injection of half a grain of atropia the pupils begin slowly to dilate, and in an hour or so the face becomes flushed, the breathing soft without stertor, and the pulse stronger. If within two hours the dose fails to produce these restoring effects Dr. Johnson repeats the injection. In less profound coma he first employs a quarter of a grain of atropia.

The Edinburgh Committee, presided over by Dr. Hughes Bennett, conclude :—

1. That sulphate of atropia is, within a limited range, physiologically antagonistic to meconate of morphia.

2. That me[illegible] [illegible] phia does not act antidotally after a large dose [illegible] whilst atropia is an antidote to [illegible] nia.

3. That meconate of morphia does not antagonize the effect of atropia on the branches of the vagi supplying the heart.

While there is doubt, then, concerning the nature and extent of the antagonism between opium and belladonna, the interesting experiments of Fraser have demonstrated beyond question that atropine is an antidote to *physostigmine*; and, as the action of these substances on man and animals is identical, he concludes that atropine will neutralize the fatal effects of physostigmine on human beings. His experiments were conducted in three ways:—(1) He administered the atropine before the physostigmine; (2) he administered them together; (3) he administered the physostigmine, and, after the animal was completely paralyzed, he injected atropine. In each series of experiments atropine averted the fatal effects of physostigmine, and that the physostigmine was employed in fatal quantities was afterwards proved by administering to the animal the identical, or even a smaller, dose by itself, when in every instance the animal speedily died. Fraser concludes that "the lethal effects of doses of physostigma greatly in excess of the minimum fatal may be prevented by doses of atropia greatly below the minimum fatal." He recommends, that "in treating cases of poisoning in man the sulphate of atropia should be given by subcutaneous injection, in doses of from one-fiftieth to one-thirtieth part of a grain. The exhibition of the antidote should be persevered with, in repeated doses, until the pupils are fully dilated and the pulse rate increased, and probably also until the hypersecretion of bronchial mucus, which greatly impedes respiration, is completely checked."

He thus summarizes the antagonism between these two substances:—"That physostigma increases the excitability of the vagi nerves, while atropia diminishes and suspends this excitability; that physostigma diminishes the arterial blood-pressure, while atropia increases it; that physostigma greatly augments the secretion of the salivary, bronchial, intestinal, and lachrymal glands, while atropia diminishes, and even completely checks, the secretions; and that physostigma contracts the pupils, while atropia, to a much greater relative extent, dilates them. Besides these effects of the action through the blood, various opposed topical effects have been observed, among which is the contraction of the veins by physostigma—the existence of which rests on the high authority of Mr. Wharton Jones—and the contraction of the arteries by atropia."

Dr. Fraser has recently published some further experiments on the antagonism between physostigmine and atropine, being led to this investigation by reflecting that while, no doubt, the more active poisonous effects of physostigmine are counteracted by atropi
it seemed possible that physostigmine might possess some p
might affect some part of the body in a manner not
atropine—and that both poisons might possibly pos

perties in common, so that while some of the poisonous properties of each substance were antagonistic, other poisonous properties might not be so opposed, nay, might be similar in kind and assist each other. His experiments confirm these conjectures. He found that after a minimum fatal dose of physostigmine, death could be averted by a dose of atropine varying greatly in quantity; but that as he increased the dose of physostigmine, the range of the antidotal powers of atropine became diminished, and that so far from requiring a larger maximum antidotal dose, the greater the quantity of the physostigmine administered the smaller became the maximum antidotal dose of atropine which could be administered, till at last a point was reached when atropine ceased to avert death. For instance with a minimum fatal dose of physostigmine, a dose of atropine, varying from nine-thousandths to five grains, prevented the rabbit's death; but on increasing the dose of physostigmine to one and a half times the minimum fatal dose the antidotal dose of atropine ranged from one-fiftieth of a grain to four grains; and on augmenting the dose of physostigmine to two and a half times the minimum fatal dose, the antidotal dose of atropine ranged from one-fortieth to two grains and a half. With three and a half times the minimum fatal dose of physostigmine the range of atropine dosage sufficient to avert death was reduced from one-tenth of a grain to one-fifth of a grain, and with four times the minimum fatal dose of physostigmine atropine failed to avert death. Here then, while atropine prevented in the first instance the fatal effects of physostigmine, yet, on increasing the dose of this latter drug, a point was at last reached when its properties, not antagonized by atropine, became fatal. But the fatal issue is not due solely to the increasing of the non-antagonized properties of physostigmine, for the *range* of antidotal dosage of atropine became lessened in proportion as the dose of physostigmine was increased, showing that the atropine assisted the physostigmine. This fact is also shown by the experiment of injecting simultaneously one-half the minimum fatal dose of each substance, which experiment results in the killing of the animal.

The foregoing experiments make it apparent that atropine is an antidote for a given quantity of physostigmine only, and that if the physostigmine is increased a quantity is at last reached, the more active properties of which are, no doubt, neutralized by the atropine, but the other properties of which, in conjunction with similar ones belonging to the atropine, are sufficient to cause death. The animal, in fact, succumbs to a summation of *minor*, secondary effects, which happen to work, for both drugs, in the same direction.

It is a most singular fact that while the minimum fatal dose of the extract of physostigmine is for a given animal, say 1·2 grains, and that of [illegible] is 2·2 grains, yet that nine-thou-
[illegible] nutes before giving the

minimum fatal dose of physostigmine may prevent the fatal effects; in other words, a quantity of atropine which produces no perceptible effect will avert many of the serious effects of a fatal dose of physostigmine.

Although then it is experimentally proved that atropine can avert death from physostigmine the question yet remains unsettled whether physostigmine can prevent death from atropine.

Dr. Fraser conceives that "with regard to the counteracting actions themselves, it is to be observed that various of the facts mentioned in the record of experiments (in this paper) tend to make mutual antagonism probable not only of one, but of several, of the actions of physostigma and atropia; and it is legitimate to suppose that, with a given dose of physostigma, the counter-action produced by a certain amount of atropia will be more perfect in the case of one or more of the antagonistic actions than in that of others; and that with certain doses of the two substances such incompleteness of counter-action may exist as would, even without the occurrence of *non*-antagonized action, suffice for the production of death."

The Edinburgh Committee confirm Fraser's statements, but find that the range of antagonism is even more restricted than the limit fixed by this investigator.

Dr. Brunton has drawn attention to the antagonism between atropine and the poisonous principle of fungi—*muscarine*. Dr. Schmiedeberg had previously pointed out an antagonism in respect to the action of these drugs on the heart; thus, whilst topically applied muscarine will arrest the heart of a frog, a mere trace of atropine, applied to this organ, will sometimes restore the pulsations even after the heart has ceased beating for four hours.

The poisons have likewise an antagonistic action on the pulmonary blood-vessels. Muscarine produces intense dyspnœa and an emptiness of the arterial system, so that cut arteries bleed scarcely at all—effects which Brunton has proved to depend on spasm of the pulmonary vessels. He narcotized an animal with chloral, and, after the lungs were exposed, kept it alive by means of artificial respiration, in which state a dose of muscarine caused blanching of the lungs, distension of the right side of the heart and vena cava, and shrinking of the left ventricle. A little atropine now injected into the jugular vein at once removed these phenomena; the lungs became rosy, the distension of the right side of the heart subsided, and the left ventricle regained its natural size. Atropine removed the dyspnœa as well as the other symptoms produced by muscarine.

Muscarine, moreover, stimulates the terminations of the chordæ tympani nerve, and increases salivary secretion, exhibiting in respect also an antagonism to atropine. Again muscarine copious perspiration. (*See* Muscarine.)

There is a well-marked and interesting antagonism betwe and *jaborandi*. Jaborandi excites profuse perspiration and salivation, and when applied to the eye it contracts the pupil, and, as Mr. John Tweedy has shown, causes tension of the accommodative apparatus, in these respects being obviously the antagonist of atropine. Jaborandi also produces a dull pain over the eyes, sometimes associated with giddiness, likewise a pain over the pubes, with an urgent desire to pass water, in these latter results *resembling* somewhat the action of atropine, yet, even as to these symptoms, the drugs are really opposed, for the injection of $\frac{1}{100}$ gr. of atropine checks not only the sweating and salivation produced by jaborandi, but also the headache and pain over the pubes, with the desire to pass water. Mr. Langley has pointed out that these drugs are antagonistic as regards their action on the heart; thus, jaborandi at first slows, and then arrests the heart in diastole, whilst atropine restores the heart's action, even after its arrest for a considerable time. These antagonistic effects on the heart are not due to an influence upon the terminations of the pneumo-gastric, but upon some intra-cardiac apparatus distal to these nerve endings.

Muscarine and jaborandi ultimately paralyze the excito-motor apparatus and the muscular substance of the heart, and atropine must antagonize the action of these substances upon these structures. But atropine itself weakens the heart by its action probably on both the excito-motor and the muscular substance. Thus we have an instance of a poison which paralyzes the excito-motor and muscular substance of the heart, antagonizing another poison which also paralyzes the same structures. In like manner pilocarpine antagonizes the action of muscarine on the heart, and in this respect is almost as efficient as atropine. Thus we have another instance of a paralyzer of the motor apparatus and muscular substance of the heart antagonizing a poison which acts similarly.

Atropine also antagonizes the action of aconitine on the heart.

Atropine, however, does not antagonize the action of digitalis nor of veratrine on the frog's heart, though digitaline antagonizes the action of muscarine, pilocarpine, aconitine, and atropine.

I venture to suggest that these antagonisms may be due to chemical displacement. That atropine, for instance, having a stronger affinity for the excito-motor and muscular substance of the heart than either muscarine, pilocarpine, or aconitine, replaces consequently these substances, substituting its own action for theirs, and inasmuch as atropine is a much less powerful paralyzer than muscarine, pilocarpine, or aconitine, it substitutes a weak for a strong paralyzant effect, and the heart is re-started.

Digitaline and veratrine have a yet stronger affinity for the cardiac structures than even atropine, and hence they antagonize the action of atropine and of all the substances which atropine is capable of antagonizing. Digitaline, however, on its addition to a heart arrested by muscarine or aconitine does not restore the lost pulsations, but changes the character of the heart, converting the widely-dilated, flabby, distended, red heart of aconitine into the small, hard, pale, rigid heart of digitalis. Arrest by relaxation is thus exchanged for arrest by spasm.

Dr. John Harley points out an interesting antagonism between *aconitine* and belladonna. He poisoned a dog with aconitine, and reduced the pulse to 65 and 75 per minute, then he gave 1-96th of a grain of atropine, with the speedy effect of both quickening and strengthening the heart, and in three-quarters of an hour the heart beat 300 to the minute, *i.e.* 230 beats faster than before the administration of the atropine. Harley adduces this experiment to show that atropine affects the heart by its stimulating action on the sympathetic, for though atropine by paralyzing the vagi might quicken the heart it could not increase the strength of the contractions; this, however, might result from the action of the atropine on the intracardiac excito-motor apparatus.

Atropine is antagonistic to *bromal hydrate.* Bromal hydrate destroys life, as a rule, by increasing the bronchial and salivary secretion to so great an extent that the animal is choked by it. Now atropine checks these secretions, and thus prevents the lethal effects of bromal. But, on the other hand, it need hardly be said that bromal will not prevent the fatal effect of atropine, for this drug does not destroy life by its influence on the bronchial mucous membrane or salivary glands.

Preyer maintains that atropine, by paralyzing the peripheral branches of the vagus nerve, will prevent the arrest of the heart's contractions, by *hydrocyanic acid*, and that it is thus an antidote to it.

That atropine is separated from the body in part by the urine may be proved by putting into the eye some of the urine voided by a patient under the influence of belladonna. J. Harley states that atropine is wholly eliminated from the body within two hours, none of the drug being found in the urine after that time.

Dr. Garrod has shown that the caustic fixed alkalies destroy the active principles of belladonna, hyoscyamus, and stramonium, but that carbonates and bicarbonates of potash and soda do not destroy them. Lime-water, also, is equally destructive, and hence it has been recommended as an antidote in belladonna poisoning (J. Harley).

The chief active constituent of belladonna, viz., the alkaloid atropine, is isomeric with hyoscyamine and hyoscine, alkaloids discoverable in the plants of the atropaceous family, the most important members of which are belladonna, hyoscyamus, and datura stramonium. In belladonna itself both atropine and hyoscyamine occur, and, indeed, it seems probable that atropine is a conversion product of hyoscyamine.

Both atropine and hyoscyamine may, under certain conditions, *e.g.*, by the action of baryta water, be made to break up into another base called tropine, and an acid, tropic acid; hyoscine also may be made to break up into a base tropine and tropic acid. Tropine can recombine with tropic acid to form atropine, or it can combine with other acids to form compounds analogous to atropine; one such compound, of tropine with mandelic acid, is named homatropi valuable mydriatic (cf. Bernthsen's *Organic Chemistry*, also *Extra Pharmacopœia*).

ETHYL-ATROPIUM, METHYL-ATROPIUM

THE action of these substances, in which an ethyl or methyl grouping is substituted for an atom of hydrogen in atropine, has been studied by Fraser with his accustomed thoroughness and ability. Fraser experimented with iodide of methyl-atropium, sulphate of methyl-atropium, and iodide of ethyl-atropium. In conjunction with Dr. Murrell I have studied the actions of ethyl-atropium. We experimented with uncombined crystalline ethyl-atropium, prepared for us by Mr. Wright, under the direction of Dr. Graham, Professor of Chemistry at University College.

From experiments on frogs, Fraser concluded that these substances paralyze the terminations of the motor nerves, leaving unaffected the sensory nerves and the spinal cord. Our experiments have led us to conclude that ethyl-atropium paralyzes the motor-nerves and the spinal cord, but leaves the sensory nerves unaffected.

Like Fraser, we find that these compounds do not tetanize.

Fraser ascertained that whilst atropine produces in dogs both paralysis and convulsions, ethyl-atropium induces only paralysis.

His experiments on rabbits showed that these substances paralyze powerfully the cardiac inhibitory fibres of the vagi.

In fatal doses Fraser found that ethyl-atropium dilates the pupil slightly. We have given it to men in doses sufficient to produce decided symptoms, but without causing any dilatation of the pupil, but we all have found that its topical application to the eye dilates the pupil widely. Our experiments on man showed that in twelve or twenty-four hours the dilatation had nearly or quite passed off.

In our experiments on man, this drug, given in doses sufficient to produce marked symptoms, neither strengthened nor quickened the heart; hence it is inferred that in the doses which we gave it does not, in man, paralyze the vagi.

In man a dose of one grain, given hypodermically, produces decided but transient paralysis, the patient being unable for a while to stand or walk, and the head tending to drop rather towards the shoulder or chest, and the upper eyelids to droop. Fraser has found that, in fatal doses, it produces complete paralysis in dogs and rabbits.

In man ethyl-atropium excites pain over the eyes, but, unlike atropine, it does not excite delirium or produce coma, nor does it check the salivary or the cutaneous secretion.

Fraser has found that these compounds act more powerfully on frogs, on rabbits, and on dogs than atropine. Our observations confirm his statement as regards frogs, but we find that the action of ethyl-atropium on man is far feebler than that of atropine. Thus a grain given hypodermically excites merely slight though distinct symptoms, whilst a grain of atropine produces great weakness and sleep, lasting some hours, with delirium.

It seems, therefore, that atropine conforms to Fraser's law, namely, that a tetanizing alkaloid, when converted into an ethyl or methyl compound, loses its tetanizing action, and becomes a paralyzant of the motor nerves. But in the conversion of atropine into ethyl-atropium and methyl-atropium many of the other effects of atropine are also lost; thus, these compounds lose not only the power of tetanizing, but also that of diminishing the salivary and cutaneous secretions, of affecting the brain, and, according to Fraser, of paralyzing the cord. On the other hand some of the properties of the unmodified alkaloid are retained unchanged in quality if not in degree, *e.g.*, methyl- and ethyl-atropium dilate the pupil, paralyze the intracardiac inhibitory apparatus and the motor nerve endings. In respect of the last-named property they are far more powerful.

As regards the effect of these compounds on the cord we suggest that there may have been some slight difference in the preparations used by Fraser and by ourselves. Our observations were very carefully performed, and we believe they may be relied upon, and we feel equally sure that Fraser's are likewise trustworthy, and therefore it is only upon the foregoing assumption that we can reconcile the discrepancy between our results.

HYOSCYAMUS

CONTAINS two alkaloids, hyoscyamine and hyoscine. Hyoscine is by far the more powerful.

Hyoscyamine, as has been said, is isomeric with atropine; the two are very similar, if not identical, in their mode of action. The crystallized hyoscyamine is given in the same dose as atropine, viz. $\frac{1}{120}$ – $\frac{1}{40}$ grain increased on occasion up to $\frac{1}{16}$, $\frac{1}{8}$ or even $\frac{1}{6}$ grain. There is also obtainable an uncrystallized hyoscyamine the dose of which should be about the same.

Hyoscine has recently suffered a change in terminology; it is said to be identical with an alkaloid scopolamine, and to be an isomer of cocaine but not of hyoscyamine and atropine (*see* ***Extra Pharmacopœia***, and Binz, *Arzneimittellehre*). However this may be, the hydrobromate of the alkaloid and the hydrochlorate are the salts chiefly in use; their dosage is $\frac{1}{300}$ – $\frac{1}{100}$ grain.

The effects of the whole drug, hyoscyamus, correspond in many, if not in all, respects to the effects of belladonna and stramonium. Thus henbane flushes the face, dries the mouth and throat, dilates the pupil, produces a subdued form of delirium and hallucination, and, in large doses, coma. It greatly quickens and strengthens the heart's contraction, and sometimes produces a red rash, which, like that of belladonna, may be patchy. It increases the quantity of urine [in some observations made by Mr. Pearce and myself it failed to produce increased action of the kidneys (Lawson)]. Poisonous doses produce a drunken gait, from loss of voluntary power, the drug acting probably on the nervous system like belladonna.

Mr. Clifford Gill tells me that the alkaloid hyoscyamine given in large doses will induce nausea and vomiting, and patients in describing their sensations say that it produces a feeling of "sea-sickness," or "deadly sea-sickness." In some valuable papers Dr. Robert Lawson has recommended hyoscyamine in various forms of mania, with the view of producing sleep, and substituting a mild for a more active and obstinate delirium. He gives a grain to a grain and a half, which in fifteen minutes generally induces sleep, lasting ten to twelve hours, out of which the patient wakes free from delusions. These large doses, however, caused sleep so deep, and a degree of paralysis so marked, as to excite alarm in both the patient's friends and in the doctor himself. It is better, therefore, to give a smaller dose, such as 1-16th to 1-8th or 1-6th of a grain, which dose is generally sufficient to induce several hours' sleep.

Hyoscyamine is especially useful in the more violent forms of intermittent mania, when it is difficult to restrain the patient. Through its action on the nervous system it quiets at once. I have tried this drug in a few cases, and my observations, in common with those of other observers, corroborate entirely the statements of Dr. Lawson.

There is very great disparity between the doses of hyoscyamine, recommended by various observers: the above doses represent the dosage by the mouth. *Hypodermically* hyoscyamine is recommended by some in doses up to $\frac{1}{4}$ grain as a maximum (Gnauck), but we would urge that the doses advocated by Browne, viz., $\frac{1}{30}-\frac{1}{15}$ grain, should be exceeded with caution, and as an *initial dose* it would be well to *begin with* $\frac{1}{100}$ *grain.*

The crystalline salts should be chosen, and Merck's preparations are advised. (Art. "Sedatives," Tuke's *Dictionary of Psychology.*)

I have tried it in four cases of delirium tremens, but without any very satisfactory results. Small doses failed to produce sleep, simply quieting the violence of the patient, and substituting the muttering delirium of hyoscyamine for the uncontrollable delirium of the disease. Larger doses produced many hours' sleep, but, on waking, the delirium and general condition were unamended. In one case we gave the alkaloid several nights successively, but without any benefit; a dose of chloral then made the patient sleep all night, this result being followed next day by much improvement. The drug will probably be useful in cases where the patient is very violent, and irrestrainable, with delirium of the type of acute intermittent delirium.

The effects of hyoscyamine are so similar to the effects of atropine and daturine[1] that I determined to compare the operation of these three alkaloids in a case of acute mania, and found that they produced almost identical results.

Hyoscyamus is sometimes used to produce sleep when opium disagrees. It has been employed in neuralgia.

Dr. Seguin finds that hyoscyamine is useful in paralysis agitans and chorea. He gives 1-50th grain daily, hypodermically, or 1-50th grain by stomach night and morning. It quiets the movements of paralysis agitans, but on discontinuing the treatment the symptoms recur unchanged.

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[1] It is now taught that in datura stramonium there are present atropine and hyoscyamine.

A physician, a very careful observer, who in his own person suffered from a spasmodic affection which he considered to be of the same nature, probably, as paralysis agitans, was accustomed to take the extract of hyoscyamus, in doses of seventy to eighty grains per diem, as a means of controlling the movements. A morning dose of 40 grains would steady him sufficiently to enable him to write a letter in the afternoon; the remaining 30 or 40 grains he would take at bedtime. These doses would produce only slight dryness of the mouth and no effect upon the eyes. Belladonna, in doses sufficient to control the movements, would cause excessive dryness of the mouth and troubled vision. The doctor, an intellectual man and a brain worker, did not experience any mental disturbance from these doses, but found that he could do good mental work upon them. These facts have especial interest as showing that whatever may be true as to the similarity of hyoscyamine and atropine, there are undoubted differences between the whole drugs hyoscyamus and belladonna.

In general the preparations of hyoscyamus are credited with a less deliriant action than those of belladonna, and a greater soporific action.

The fixed caustic alkalies destroy hyoscyamine, like atropine, as Sir A. Garrod has proved.

HYOSCINE is the other of the alkaloids of hyoscyamus; Ladenburg first extracted it from the mother liquid after hyoscyamine had crystallized out. It is employed in the form of the hydrobromate or hydriodate.

Dr. Horatio Wood, who has drawn prominent attention to the drug, has made a physiological examination of it. He finds that it depresses the spinal cord, in this respect corresponding with the secondary effect of atropine. It leaves, however, the motor nerves unaffected, differing in this from atropine, which somewhat depresses the motor nerves. Like atropine, it kills by paralyzing the respiratory centre, and so arresting respiration, but, unlike atropine, when the frog recovers from the paralysis due to a full dose, no tetanus arises.

Hyoscine affects the heart and circulation but slightly, and hence the blood pressure is but little affected. At first there may be a slight fall in the pressure, probably due to the drug weakening the heart somewhat. Very large doses, as in the case of atropine, will l blood pressure by depressing the heart and by paralyzing th motor centre, but this effect is only produced by really doses. Unlike atropine, hyoscine slows the heart, and in man the pulse will sometimes fall to 48 or 50. This retardation of the heart is due to an action on the intra-cardiac structures, for the fall in the frequency of the pulsations occurs even when the vagi are cut. Like atropine, it antagonizes the effect of muscarin on the heart.

Like atropine, hyoscine at first excites delirium, followed by a deep sleep; sometimes as the sleep passes off the delirium returns. Patients who have taken a full dose feel stupid and giddy, their movements are incoordinate, the face is often flushed, sometimes it is pale; they complain of frontal headache. In all these respects again hyoscine corresponds with atropine.

Hyoscine reduces somewhat the frequency of the respirations, and it may induce Cheyne-Stokes' breathing.

Like atropine, it dries the mouth and dilates the pupil, but, unlike atropine, it does not apparently check perspiration, and, in some cases, where very marked symptoms have occurred, the skin has been moist with perspiration.

It is employed chiefly as a calmative or soporific, especially in maniacal cases. In other cases it should not be given till the more usual hypnotics have been tried, for its action is somewhat uncertain, and the susceptibility to the drug varies greatly in different people, and hence symptoms rather alarming in appearance, though not dangerous, may arise. It is the best remedy to calm the delirium of mental affections, and to induce sleep. It is useful in puerperal mania. From $\frac{1}{150}$ to $\frac{1}{100}$ of a grain, given by the mouth, is the dose that usually succeeds, but $\frac{1}{80}$ to $\frac{1}{50}$ may be required. It can be administered without difficulty, as it is tasteless. To quell mania it may be given hypodermically in $\frac{1}{100}$ grain dose. Wood has found it useful in the sleeplessness arising from worry or excessive cerebral activity, or where the sleep is much harassed by dreams; it may succeed when other soporifics have failed: the sleep is refreshing.

According to Mitchell Bruce, kidney disease does not contra-indicate the use of hyoscine, and he states also that he has used the drug with benefit in exceedingly feeble states of the heart.

It is highly recommended in paralysis agitans, as able to remove the tremor and the contracture; on discontinuing the medicine, however, these symptoms return. In this disease $\frac{1}{250}$ grain is a sufficient dose.

It will check salivation, and the sweating of phthisis.

Topically applied, it dilates the pupil, its effects passing off more quickly than those of atropine, but sometimes it is absorbed in sufficient quantity to produce general symptoms.

Wood finds it useful in spermatorrhœa.

It does not relieve pain.

It sometimes excites nau[illegible] vomiting.

It is excret[illegible]

The caustic alkalies are incompatible with hyoscine, thus hyoscine in their presence loses its mydriatic powers.

STRAMONIUM

STRAMONIUM produces symptoms very similar to those induced by belladonna. A stramonium ointment, used at the Middlesex Hospital, is made by mixing half a pound of fresh stramonium leaves with two pounds of lard, and gently heating till the leaves become friable, then straining through lint. This ointment spread on lint and applied thrice daily relieves pain.

Stramonium, smoked with or without tobacco, is much used to reduce spasm in asthma. It is especially valuable in pure asthma, that is, when the lungs are structurally free from disease; it is useless when the dyspnœa is due to heart disease. Twenty grains of the dried leaves, or ten of the powdered dried root, may be smoked, inhaling the fumes into the lungs; or an inverted tumbler, into which the fumes have been puffed until it is full, may be placed over the mouth, and the contents drawn in by a deep inspiration. It excites a good deal of cough. The inhalation may be repeated again and again. It is better to smoke the plant unmixed, since but few can draw the fumes of tobacco into the lungs without great discomfort. There is no doubt that, in many cases of asthma, stramonium is very successful; but in others, without apparent reason, it fails, and, even where it succeeds, its influence diminishes gradually by use. Sometimes datura tatula succeeds when datura stramonium fails, Whitla also bears testimony as to this. Dr. Salter believed that stramonium often failed owing to the badness of the preparation, and he advised asthmatics to grow and prepare their own stramonium. Its effect is more manifest when employed at the very commencement of an attack, affording but little relief when the paroxysm is fully developed. Cold stramonium smoke can sometimes be inhaled when the hot smoke is intolerable.

The drug has been used in neuralgia.

As in the case of belladonna and hyoscyamus, the active principle, as Sir A. Garrod has shown, is destroyed by caustic potash and caustic soda.

It is probable that the alkaloid of stramonium, daturine so called, is really a mixture of hyoscyamine and atropine. Its dosage is the same as that of hyoscyamine and atropine, viz., $\frac{1}{120}$ - $\frac{1}{60}$ grain.

The official preparations, tincture and extract, are mad
seeds of stramonium.

DUBOISIA MYOPOROIDES

MR. JOHN TWEEDY introduced this solanaceous plant into this country; it has been employed for some time in Australia. It yields an alkaloid which possesses the same properties as atropine, but is more powerful in its action on man. It dilates the pupil and paralyzes the muscle of accommodation. It checks perspiration, and dries the mouth. It produces delirium, headache, great weakness, and sometimes a rash similar to that of belladonna. It accelerates the pulse and antagonizes the action of muscarine on the frog's heart; it tetanizes and paralyzes. The alkaloid is so powerful that a 1 in 120 solution applied to the eyes often excites great giddiness, weakness, and a "drunken feel." Though duboisine acts much more strongly than atropine on man, atropine acts more powerfully than duboisine on frogs. Duboisine is now considered to be identical with hyoscine; but in some respects it differs from the accounts given of hyoscine, for it certainly checks perspiration, perhaps it may be more correctly considered as a mixture of hyoscine and hyoscyamine. Duboisine has been employed in mania, but it possesses no advantages over hyoscine or hyoscyamine that we know of. It must be administered cautiously, and we should advise that the dose should not exceed $\frac{1}{200}$ grain to commence with; much larger doses, *e.g.*, $\frac{1}{70}$ to $\frac{1}{30}$ grain, have been given in mania, and in insomnia.

HYDROCYANIC ACID, CYANIDE OF POTASSIUM

THESE poisonous substances are destructive alike of animal and vegetable life.

When applied continuously to the skin, solutions of the cyanide excite some inflammation, on account of their alkalinity.

Kept in contact with the skin for a while they diminish sensibility. Formerly they were employed, externally, in painful diseases, such as neuralgia and rheumatism, now, however, they are quite superseded by remedies more successful in these affections. In allaying the tormenting itching of urticaria, lichen, eczema, and prurigo, they are undoubtedly very serviceable. The itching skin should be bathed with a lotion made of a drachm of the cyanide of potassium to a pint of water, or thirty drops of dilute hydrocyanic acid to the ounce of water or glycerine. In respect to the cyanide, the action of the prussic acid is assisted by the potash combination with it.[1] It must be very strictly enjoined that such a lotion be not applied to a broken skin, for fear of poisoning by absorption. The Aqua laurocerasi contains prussic acid as its active principle, in strength 0·1 per cent.; 20 drops are, therefore, equivalent to 1 drop of dilute hydrocyanic acid.

The acid possesses a bitter, characteristic taste, and excites a sensation of itching in the mouth. It stimulates the flow of saliva, possibly by its action on t [illegible] us membrane of the mouth.

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[1] This being [illegible] ompatibility (therapeutic) in mixing h [illegible] scribing a sedative lotion.

Taken in moderate dose, into a healthy stomach, the acid appears neither to produce nor to undergo change; it is, nevertheless, much used, and frequently with decided benefit, in painful diseases of this organ, as, *e.g.*, in chronic ulcer, cancer, chronic gastritis, gastralgia, etc. Not only does it occasionally mitigate the pain of these affections, but it may also check vomiting. This action we may regard as purely topical, and the equivalent of its external sedative action.

Hydrocyanic acid passes very speedily into the blood, and is as speedily eliminated, probably in chief part in the breath; hence, after a poisonous dose, if life can be supported for half an hour the patient is generally safe.

As Brunton points out, the symptoms induced by a fatal dose of prussic acid are identical with the symptoms of rapid asphyxia, with the exception that in hydrocyanic acid poisoning the blood is arterial in tint and that artificial respiration will not avert death.

Prussic acid is a general poison, affecting all parts of the nervous system and the muscles also, as one might expect in a remedy that induces asphyxia. It has not been proved how it induces asphyxia, but it has been suggested that its combination with hæmoglobin lessens oxidation. Cyan-hæmoglobin, however, is often absent from the blood in prussic acid poisoning. Large doses of prussic acid kill by arresting the heart, smaller doses kill by paralyzing the respiration.[1]

The arrest of the heart is due partly to irritation of the vagus roots, and partly to the action of the poison on the cardiac ganglia and muscular tissue. The drug first raises arterial pressure, but soon lessens it.

From experiments on frogs, Kölliker concludes that prussic acid paralyzes first the brain, next the cord, and then the motor nerves, the paralysis extending from the centre to the periphery. It paralyzes the heart, the ventricles ceasing in diastole. The voluntary muscles soon lose their irritability, and become stiff.

Preyer maintains that a large dose of hydrocyanic acid paralyzes the heart at once; that moderately fatal doses deprive the blood of oxygen; and that, as belladonna paralyzes the peripheral branches of the vagus, and at the same time stimulates the nervous centres of respiration, atropia in these cases, hypodermically injected, will prevent death.

Hydrocyanic acid is a useful addition to cough mixtures, to allay irritable cough. Syrup of Virginian prune, which is often employed in cough mixtures, owes its efficacy probably to the prussic acid which it contains.

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[1] In certain cases of poisoning the blood is found to be dark; Bru suggested in explanation, that these cases are those in which de place more slowly and is by respiratory failure, whereas the fatal bright blood occur when death is sudden and cardiac. The subject, is complicated, and the exact reason of these opposite conditions of is not clear. (*See* Wood's *Therapeutics.*)

Prussic acid has a deservedly high reputation in the treatment of stomach affections, in particular in those forms, dyspeptic or other, in which pain is a prominent symptom. It is usually combined with bismuth and an alkali, but it may also be added to acid mixtures; the former prescription is the more sedative.

SULPHO-CYANIDE OF POTASSIUM

DR. GEE employs the sulpho-cyanide of potassium in tinea tonsurans. He recommends that the hair be kept close cut, and the scalp washed twice a day with warm water and soap, and that then, after drying the head, the patches be well rubbed with a lotion composed of half an ounce of sulpho-cyanide of potassium, 1 ounce of glycerine, and 7 ounces of water. The scalp should be covered night and day with lint soaked in this lotion, super-imposing a piece of oiled silk; a stronger solution is apt to excite eczema.

OPIUM

OPIUM affects chiefly the brain and the spinal cord, in the lower animals it excites tetanus by its action on the cord.[1] It has very little action on either sensory or motor nerves, though some observers maintain that it first stimulates and then depresses the sensory nerves. The muscles are unaffected by it.

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[1] On the lower animals and even on man the effect of opium and its active principles is a very variable one; thus, small doses of opium excite tetanus in frogs, but birds, such as ducks, chickens, and pigeons, cannot be poisoned by crude opium, by the aqueous extract, or by black drop (acetum opii), given internally, and morphia salts must be given to them in enormous doses to produce poisoning. Morphia employed hypodermically in very large doses never causes either sleep or stupor in these creatures, but convulsions. Thebaia is a tetanizing agent, inferior only to strychnia and brucia. Narcotina, almost without effect on man, destroys birds in doses of two to seven grains when used hypodermically. Codeia is a fatal convulsive agent to pigeons. Meconia given internally causes emesis, but is harmless when injected under the skin. Narceia has no perceptible influence, except to disturb the respiration slightly. Cryptopia in doses of one-fifth to one-half a grain has no effect. None of these agents cause sleep in pigeons, ducks, or chickens (Dr. Weir Mitchell.)

Dogs, cats, and rabbits require large doses of opium to produce stupor or sleep, and this is generally accompanied by convulsions. In the lower animals, *e.g.*, frogs, opium only excites tetanus, but as we ascend in the animal kingdom the soporific effects become apparent, and are most marked in man. Race modifies the effects of [illegible] ves the Javanese and Malays into temporary madness [illegible] its effects vary considerably in different indi [illegible] v women, it produces much excitement, [illegible] etimes pleasant, at other times extre [illegible] to induce sleep it soothes, an [illegible] persons it induces restlessne [illegible]

Large doses paralyze the vaso-motor centre.

Bernard's experiments led him to conclude that opium depresses the functional activity of the sympathetic system, and notably that part supplying the submaxillary gland. Gscheidlen considers that opium affects the terminations of the motor nerves, small doses at first heightening, but afterwards depressing, their function, whilst large doses depress from the first. Opium is said to lessen the conductivity of sensory nerves, though the blunted sensibility present must be due in great measure to the effect of opium on the grey matter of the brain, depressing the power of perception.

Considering now the action of opium more in detail, we note first that poultices containing laudanum are used to allay the pain of superficial and even of deep-seated inflammations, and enough may be absorbed in this way to produce deep sleep. Friction considerably increases the absorption, and thus liniment of opium, well rubbed in, relieves neuralgia, pleurodynia, and myalgia, probably by a combination of local and general anæsthesia. The abraded skin absorbs still more freely, and preparations of opium or morphia are applied to irritable, cancerous, and simple sores, again for both topical and general effects. Morphia, dissolved in glycerine and spread on lint, is a useful application to a painful, cancerous sore.

For carbuncles and boils, Dr. Buxton Shillitoe strongly recommends the local application of an extract of opium of the consistence of treacle. The extract must be smeared on thickly three or four times a day, over and around the swelling. Applied early, it often causes the boil to abort, or it limits its progress and eases pain. After the use of the extract, Mr. Shillitoe applies a plaster, composed of equal parts of soap, opium, and mercury, spread on thick leather. Should suppuration set in, he lets out the matter, and applies a poultice over a small hole cut in such plaster.

Dropped into the eye, laudanum and solutions of morphia cause smarting, redness, and slight inflammation of the conjunctiva. They contract the pupil, but in a less degree than if administered in other ways. Opium, however, is never used specifically to contract the pupil, Calabar bean effecting this more safely, easily, and thoroughly. Opium wine, dropped into the eye, is used to relieve the pain of conjunctivitis, and by slight stimulation to improve the condition of the membrane. The wine of the present Pharmacopœia, containing spices, must not be so employed, as it would aggravate the mischief: the wine of the Pharmacopœia of 1864 should be used. Mixed with either tannin or creasote, opium is introduced into the hollow of a painful tooth, and if the pain be the result of inflammation of the exposed pulp, this application often gives relief.

In the course of the following pages we shall see other instances of the local anodyne action of opium, in the use of linctuses, suppositories, etc.; even in the hypodermic injection of morphia, some part of the therapeutic value obtained is probably local, and for this reason it is advisable, where possible, to make the injection in the neighbourhood of the pain.

The preparations of opium are rarely used for their topical action on the throat, but their good effects are often, I think, due to the local action. For instance, many coughs, as in some cases of phthisis, are really produced by the condition of the throat—red, inflamed, and even ulcerated—which condition excites much irritation, and a frequent hacking cough, especially troublesome at night. The topical application of morphia dissolved in glycerine, honey, treacle, syrup of Virginian prune, mucilage, or some other viscid substance, which will cause the mixture to linger some time over the irritable membrane, often relieves this kind of cough. It is well known that the cough of chronic phthisis is often best treated by directing the patient to retain for some time in the pharynx a weak solution of morphia in glycerine, honey, syrup, or mucilage, so as to blunt the irritability of these parts. Hence, too, the excellent effects of morphia lozenges allowed to dissolve slowly in the mouth. Even in coughs entirely dependent on lung disease, opium or morphia administered so that the medicine clings for some time to the structures just outside the larynx, appears to have a greater influence than when the medicine is conveyed quickly into the stomach. This result is probably due to the fact, heretofore insisted on, that drugs appear to possess remedial virtues over the organs of the body, even when applied only at the orifices of the passages leading to them.

The following is a good formula to allay coughs:—Morphia, one-fortieth part of a grain; spirits of chloroform, three minims; glycerine, syrup of lemons, diluted honey or treacle, one drachm. The dose should be repeated frequently, when the cough is troublesome, till the paroxysm is subdued.

A somewhat full dose of opium produces much disagreeable dryness of the mouth and throat. The same annoying symptom follows likewise the hypodermic injection of morphia.

It is often taught that morphia should not be given in catarrh or bronchitis, and no doubt when the expectoration is abundant, and there is duskiness of the skin, showing deficient oxidation, opiates or other narcotics that produce profound sleep must be given very guardedly, otherwise the expectoration during sleep may accumulate in the lungs, and give rise to serious results. On the other hand, we meet with cases of very violent and frequent cough. Yet there is free expectoration, and no signs of impaired oxidation. In such cases opiates will relieve cough, and by this act lessen expectoration, for the secretion of mucus in the bronchial tubes is certain
by violent coughing, and when this is allayed the ex

comes much less abundant (that coughing may excite secretion in the bronchial tubes is shown by the common fact that if a patient can restrain his cough the expectoration becomes less, without any signs of accumulation in the lungs). But, even in the first named cases of extensive bronchitis with more or less cyanosis, we shall in many cases give opium with advantage so long as we proceed cautiously with the dose, and have the patient well under observation.

Taken into the stomach, opium lessens both its secretion and its movements, and consequently checks digestion. Its retarding effect on digestion is exemplified by the well-known fact that when an opiate is given too near a meal the food vomited hours afterwards may be only very partially digested. According to Bernard, even a hypodermic injection may have this effect, for he found that the crops of pigeons were full after a hypodermic dose of morphia. Here, then, we have a sufficient reason why opiates should not be given shortly before or after a meal, unless, indeed, it is intended to diminish appetite, or to hinder the natural movements of the stomach.

Opiates, not uncommonly, excite nausea and vomiting, symptoms very apt to occur in the morning after a night dose.

Opium, or its alkaloid, morphia, is given to quell the pain of many stomach affections and to check the vomiting which may accompany them. Thus it is useful in cancer and chronic ulcer of the stomach, and in chronic gastritis from excessive indulgence in alcoholic drinks. Morphia, in small doses, combined with tonics, taken a short time before meals, is very efficacious in removing the pain, the nausea, and the want of appetite, so often connected with alcoholism. In the treatment of gastrodynia with heartburn it is usefully combined with bismuth. The improvement in the appetite will probably be the result of the influence of the other ingredients of the prescription—the alkalies, bismuth, bitters, etc.—the opium overcoming the gastric irritability and permitting these to act.

The effects of opium on the intestines are identical with the effects on the stomach; that is to say, the drug checks both secretion and movement, thus constipating the bowels in health and restraining diarrhœa in disease. Constipation, one of the disagreeable consequences following an opiate, is much less marked when morphia is employed hypodermically.

Some persons can never take even a small dose of laudanum or morphia without suffering, for a day or two, from clay-coloured motions and high-coloured urine.

Opium, or its alkaloid, morphia, is very frequently and very beneficially given in both acute and chronic diarrhœa. It is useful in the acute forms, *after the expulsion of the disturbing irritant.* It is, moreover, of great use in the chronic diarrhœas of tuberculosis, dysentery, and other organic diseases.

In typhoid fever, opium in small doses, given at night, may serve a double purpose: it will combat the wakefulness and delirium, whether this latter be of the boisterous or muttering kind, and will often produce sleep, at the same time it will control or even subdue the diarrhœa.

There is a form of dyspepsia and diarrhœa which yields to small doses of opium. In this there is probably increased peristaltic action of the stomach and intestines, so that the food, soon after it is swallowed, is forced in a half-digested state through the pylorus into the intestines, where, owing to its crude condition, it acts as an irritant, exciting the vermicular action, already acting unduly, so that a diarrhœa of partially-digested food occurs soon after a meal. The patient thus suffering will often complain of a sensation of emptiness and hunger, which is relieved for a short time by the taking of food, but the meal being imperfectly digested, and expelled too soon, the system is imperfectly nourished, and these uncomfortable symptoms quickly recur. The characteristic symptoms are—a sinking at the stomach, relieved for a short time by the taking of food, and the occurrence of an evacuation of partially-digested food immediately after a meal, nay, sometimes even before it is finished, and generally at no other time. This complaint, a common form of chronic dyspepsia in children of from six to twelve years of age, is quickly arrested by administering two to five drops of tincture of opium a few minutes before each meal; this dose seems to be sufficient to check the excessive muscular action, and so enable the food to tarry a sufficient time to undergo digestion. Still more effective in such cases is arsenic.

Colic of the intestines is well combated by small doses of opium or morphia, frequently repeated. As this painful affection is generally accompanied by, and is dependent on, constipation, a purgative should likewise be given. The opium assists the purgative by relaxing that contraction of the intestines which hinders the passage of the intestinal contents.

Opium quiets the intestinal movements in inflammation of the peritoneum and of the intestines, also in wounds of the abdomen. Opium acts usefully in peritonitis, not only by restraining the intestinal movements, but by its direct beneficial influence on the inflammation; the dose must be rapidly increased up to the limit of toleration, and very large doses, *e.g.*, several grains every two or three hours, may be required. In the treatment of typhlitis and perityphlitis the value of opiates is very striking—we might add also a Fabian policy.

Opiates are administered by the rectum for a variety of purposes. Laudanum injected mixed with an ounce of mucilage of starch, at a temperature of 100° or thereabouts, is very effectual in checking acute and chronic diarrhœas; and in those severe forms of diarrhœa which sometimes carry off young children in a few hours, a laudanum injection is often the speediest way of controlling the dangerous flux. When other methods fail the same injection often checks the purging of typhoid fever, or of tubercular ulceration of the intestines, or of dysentery. It is highly useful in pain of the bowels and of the organs in the neighbourhood of the rectum. Thus, an opiate injection will generally subdue the pain and frequent micturition of cystitis, and the pain arising from various uterine diseases. A suppository of opium or morphia is sometimes introduced into the rectum as far as the finger can conveniently carry it, but the injection of laudanum and starch is more effectual.

Opium mixed with ointment of galls is an excellent application in painful, bleeding piles, and in fissures of the anus, which cause excruciating pain with each evacuation. Mild purgatives should be simultaneously employed.

Opium injected into the rectum is absorbed, and affects the distant organs of the body. A rectal injection will sometimes induce sleep when the ordinary method of administering it by the mouth fails completely. In obstinate forms of dyspeptic sleeplessness, or the wakefulness of convalescents from acute disease, the injection of laudanum by the rectum will often prove successful. Both Dupuytren and Graves state that in delirium tremens and traumatic delirium this mode of giving opium is preferable to its administration by the mouth. The dose of laudanum injected into the rectum must depend on the nature of the case. If employed to relieve local pain a small quantity will generally suffice, but to produce sleep, a dose must be given about threefold or fourfold that administered by the stomach—at least, so it is generally taught; an ordinary medicinal dose, however, even when given by the rectum—well cleared out previously by a simple enema or purgative—is often amply sufficient to ensure sleep.

The active principles of opium pass readily, unaltered, into the blood, and whether the opium is swallowed or injected under the skin the same symptoms are induced.

To one unaccustomed to opium a small dose produces a soothing and luxurious mental calm, followed in the course of forty or fifty minutes by a disposition to sleep; if this does not happen, the drug gives general repose to both body and mind. The pulse at first (in ten to twenty minutes), quickens slightly to the extent of some eight or ten beats, but in half to three-quarters of an hour it again falls; at the beginning it is also made stronger and more resistant. The mouth and pharynx become dry, and perspiration often breaks out. Larger doses, *e.g.*, two to three grains, generally produce at first much excitement, with noises in the ears, and closely contracted pupils. The ideas then become confused and extravagant, and decided delirium may occur, the head also feels heavy and full and the senses are blunted; upon this a sleep follows, which is often heavy or even stertorous, and may be harassed by disagreeable dreams: the while the pulse, at first full and frequent, soon becomes slow.

The susceptibility to the action of opium, and the symptoms produced, vary greatly in different persons. Some are so easily affected by opium that even a small quantity endangers life; a susceptibility so extreme is, however, not common. In some it produces only disagreeable sensations and ideas, in others just the reverse; in some the stimulant effects predominate, in others the narcotic. Some persons after a moderate dose of opium never become heavy or drowsy, but feel the drug diffuse a glow throughout the body, followed by a luxuriant calm of mind and body. I have heard some people who were not accustomed to opium say they dare not take it, for the sensations it produced were so delicious that they feared the temptation to take it might become irresistible. There are others, again, who after even a minute dose become excited, restless, sleepless, and even delirious.

After a poisonous dose the primary stage of excitement is very brief, and narcotism supervenes rapidly. Great giddiness and a sensation of oppression come on, with an irresistible craving for sleep. There may be both nausea and sickness. The sleep soon passes into profound insensibility, the breathing grows slower and slower and more and more shallow, till it ceases. The face becomes pale, or livid and bloated, and the veins swollen. The pulse, at first full and strong, becomes small, feeble, and thready. The pupils are very greatly contracted. Gradually the power of swallowing is lost, the pupils become insensible to light, and the muscles relax; the patient cannot now be roused from his state of profound insensibility. Mucus next collects in the throat, and at last, the breathing ceasing, death takes place. Patients may die in a state of collapse, and not from asphyxia, though death usually happens from paralysis of respiration.

Sometimes in the final stages of opium-poisoning the breathing stops for a time, and then recommences, this alternation being repeated. In this late stage whilst the breathing continues, the pulse is frequent, often 120 to 140, but when the respirations cease, the pulse falls progressively in frequency till it reaches, say, 80 or 90; it may then suddenly drop to the extent of perhaps twenty beats, this drop preceding always the recommencement of breathing, which, after two or three respirations, brings the pulse rapidly back to its original frequency. Sometimes the first sign of recommencing breathing is a slight movement of the larynx. Similar changes in the pulse are sometimes observed in Cheyne-Stokes' breathing.

In opium poisoning a variety of other symptoms occur occasionally, such as diarrhœa, diuresis, convulsions (most common in children), lockjaw; sometimes there are dilated pupils, and sometimes one is dilated while the other is contracted; other occasional symptoms are itching and dryness of the skin.

In some features, opium poisoning simulates apoplexy, drunkenness, and uræmic coma.

Opium poisoning may be generally discriminated from apoplexy by attention to the following points:—history of the attack, odour of breath and vomited matters, the patient's age, and the state of the pupils, which in apoplexy are very generally dilated, and are very often unequal.

Only cases of profound intoxication put on a superficial semblance of opium poisoning. In each case there is great insensibility. If the drunkard can be roused he answers questions incoherently, but if poisoned by opium, although he is slow to speak, yet his answers are rational and to the point. The breath and vomited matters will very often tell if alcoholic drinks have been taken, but it must be recollected that suicides by laudanum not uncommonly take the drug in beer or other drinks; even then, however, the odour of the laudanum may generally be detected. In opium poisoning the pupils are much contracted, but in profound drunkenness the pupils are widely dilated. The early symptoms of the attack, if available, are sufficient to ensure discrimination between opium and alcoholic poisoning.

Uræmic coma may occur very suddenly and without the presence of any, or of scarcely any, dropsy. To distinguish such a case from opium poisoning the history of the attack should be ascertained. A patient in uræmic coma can generally be roused partially, when some information can be extracted from him. An analysis of the urine may throw much light on the case, and the state of the pupils generally precludes suspicion of poisoning by opium. The presence of a hypertrophied heart, a high tension pulse, and a small quantity of albumen in the urine would show that the patient suffered from contracted kidneys,—the form of kidney disease usually producing uræmia, but which, however, also favours cerebral hæmorrhage.

Effusion of blood into the pons varolii will produce symptoms almost identical with those of opium poisoning; thus in both cases there is profound insensibility, with closely contracted pupils, and slow stertorous breathing. It may be impossible to discriminate between these two conditions till a *post-mortem* examination reveals the real cause of death.

In poisoning by opium *use the stomach pump, rouse the patient and keep him constantly moving to prevent sleep*; give strong coffee, apply *cold affusion to the head*, and, if necessary, adopt artifical respiration.

It is not an uncommon practice to give brandy or wine to a patient recovering from the effects of a poisonous dose of opium, with the view of overcoming drowsiness; but having watched the action of alcohol under these circumstances I have always found that it greatly increased the sleepiness, and, in fact, did harm.

In this country the habit of opium-eating is not so largely indulged in as among Asiatics, but it is practised here in some localities to a startling extent. It is taken for its primary stimulating effect, but after a time increasing doses are needed to produce this result. Though carried to a very great pitch, opium-eating in some individuals induces neither physical nor mental weakness; others waste, and grow physically and mentally weak, irritable, fretful, and desponding, especially when the opium is withheld; the memory becomes much impaired; the skin becomes sallow: strange to say, in many cases the bowels are not constipated.

The horrors which opium-eaters suffer when the drug is withheld are well known, and need not be dwelt on here; so great, indeed, is the suffering, that few have sufficient resolution to relinquish the habit. The amount of opium taken is often enormous. De Quincey took 320 grains daily. Moderate indulgence of the habit is perhaps not more prejudicial to health than tobacco-smoking.

In the course of fevers, specific or inflammatory, soporifics, and above all others opium, are often of the greatest value. Some patients first show signs of failing in the nervous system, and this depression of the nervous system is generally due to want of sleep. From sleeplessness the nervous system becomes exhausted and the patient wanders. If sleep does not occur spontaneously, or is not induced by drugs, the delirium becomes more marked and may be violent, as is often the case in typhus, or muttering, as in typhoid fever. With the further progress of the exhaustion of the nervous system there arise the trembling movements of the extremities and of the protruded tongue, and the general twitching of the muscles. The tongue becomes dry; appetite, digestion, and assimilation become depressed. In addition to nervous exhaustion, there arise, even though the heart's action has for some time remained good, the signs of cardiac exhaustion, as shown by a frequent and feeble pulse; henceforth the patient must be considered to be in a highly critical condition. If during the course of fevers, having these tendencies, laudanum is given early, and before much nervous exhaustion has occurred, refreshing sleep will be induced and the nervous system sustained, and hence the need of stimulants may be avoided or much lessened. Ten or fifteen drops of laudanum, as a hypnotic, generally suffice, but the effect is made much more certain by the addition of ten or fifteen grains of chloral.

It may, however, happen that the opportunity for warding off nervous weakness has been lost, and that the patient has become very delirious. If, in such case, the delirium is of the furious kind it is well to combine the opium with tartar-emetic, as this combination calms the excitement and produces sleep more speedily and effectually than opium given alone. Graves gave three or four drops of laudanum, and one-sixth to one-eighth of a grain of tartar-emetic every two hours till tranquillity and sleep were ensured; in very boisterous delirium he increased the dose of tartar-emetic. But if the delirium is of the muttering kind, laudanum either alone or combined with chloral is preferable. The hypodermic injection of morphia often succeeds in such cases. The good effect of opium in cases of marked nervous exhaustion is well instanced by the following typical case:—A patient sleepless with twitching and tremor of the muscles, quivering, dry, brown tongue and parched skin, with rapid and feeble pulse, is given a dose of laudanum and soon falls into a sleep of several hours; upon this, the delirium abates or disappears, the twitching and quivering of the muscles become much less, the tongue becomes moist, the appetite improved, and the pulse stronger and less frequent: by the nightly use of laudanum this improvement is sustained.

Laudanum, by inducing sleep, lessens greatly the amount of alcohol which otherwise would be required, and if the laudanum is given early, alcohol is not often needed.

The cases I have here depicted, in which the nervous system is the least resistant, contrast strikingly with another class of cases where the resistance is least in the heart, and this organ, instead of the nervous system, yields primarily. In such a case we get signs of danger in the frequent and feeble pulse; and this may occur whilst the general strength appears good, the voice is strong, the appetite and digestion fair, and there is no delirium. Where the heart failure occurs early, opium is of little use, and alcohol is required. In such a case digitalis is often very serviceable, slowing the heart and sustaining its strength and so obviating the need for much alcohol. Quinine with digitalis is also useful in the case just described.

The hypodermic injection of morphia, originated by Dr. Alexander Wood, is now extensively employed to relieve pain, produce sleep, prevent spasm, and for other purposes, and is often preferable to the administration of the drug by the mouth. Its action is more rapid, its effects more permanent, and it neither destroys the appetite nor constipates the bowels. At first not more than a sixth part of a grain should be injected; a larger quantity produces sometimes serious symptoms. Professor Wood's rule is:—"In females unless very robust the maximum dose (initial) should be $\frac{1}{8}$ grain; in men $\frac{1}{6}$ – $\frac{1}{4}$."

An injection causes not unfrequently a good deal of excitement, giddiness, even intoxication, great nausea, and repeated vomiting followed by considerable depression. Often, indeed, the patient is unfitted for work during the rest of the day. These inconveniences, however, can mostly be avoided by keeping the patient recumbent for some hours after the injection. Belladonna seems to obviate these unpleasant symptoms, if combined with morphia in the relative proportion of twenty parts of morphia to one part of atropia.

An injection produces occasionally redness of the face, contraction of the jaw, dyspnœa, clonic spasms of the limbs, a frequent hammering pulse—symptoms which last about five minutes, and are followed on their decline by violent sweating. These symptoms are said to occur when the injection enters a vein directly. By long persistence in hypodermic injections the system becomes habituated to the drug, so that not only must the quantity be increased, but, when discontinued, the patient suffers the same depressing effects which an opium-eater experiences when deprived of his opium. Sometimes these sufferings are so severe that patients declare that the distress occasioned by the intermission of the injection is worse than the pain itself, for which the injections were administered. The injection may be made into any part of the body, but for the sake of convenience, it is better to choose a place where the skin is loose. A fold of skin should be pinched up firmly, and then the needle thrust quickly through it into the subcutaneous tissue. If patients dread the slight pain of the puncture, the sensibility of the skin may be first deadened by the ether spray, or by the application of a piece of ice dipped in salt. It is hardly necessary to say that it is rarely advisable to allow a patient to administer the injection himself. Immediately after the injection, a sharp smarting pain is felt, and in many cases a large flat wheal, like that of urticaria, soon arises. If care is taken to make the solution as nearly neutral as possible, the pain is much reduced. It should be remembered that these injections leave sometimes a hard horny cicatrix; hence it is important to inject some part of the skin covered by the clothes.

Eulenberg states that the sensibility round the punctured spot is lessened if the injection is made over a superficial sensory nerve, and that the sensibility of the whole skin territory of the nerve is somewhat blunted—clearly a direct topical effect.

A single injection will sometimes cure recent and even long-standing sciatica, facial and other neuralgias, but usually it gives only temporary relief, and the injection must be repeated from time to time. Whitla's method of treatment of sciatica by the injection of a weak solution of morphia, into the sciatic nerve, if possible, combines, he says, the methods of acupuncture and aquapuncture with the direct local effects of morphia. He praises it as the best treatment known to him; his method is as follows:—he takes the dose of morphine determined upon, say, ¼ grain or more, and then fills the syringe, of 20-30 minim capacity, with distilled water. This syringeful he injects, in divided portions, at several points along the course of the nerve, puncturing deeply, at right angles to the surface, and endeavouring each time to transfix the nerve. In our hands, a recent case of acute sciatica yielded very promptly to this treatment; a single injection, only, being required.

Injections continued for days, weeks, or perhaps months, will sometimes cure obstinate cases of neuralgia and its allies. Sometimes every second day, or twice a week, is sufficient to mitigate the pain and after a time to cure. A single injection frequently cures lumbago at once, but, inasmuch as the mere insertion of a needle is often equally efficacious, some of the speedy cures attributed to the injection must be due to the effects of unintended acupuncture. Hypodermic injection relieves the pain of severe pleurodynia, but most cases of pleurodynia yield to milder treatment. It is particularly efficacious in the pain of renal, biliary, and intestinal colic. Although not often required, a mild morphia injection will allay severe toothache. Morphia injections are sometimes needed to relieve the pain of acute inflammations, such as pleurisy and pneumonia, but are rarely required unless the suffering is severe or persistent.

Morphia injections are used to produce sleep. Morphia, subcutaneously injected, acts more speedily and in smaller quantities than when swallowed.

Morphia is injected to produce sleep in acute mania, delirium tremens, chorea, etc. In delirium tremens, even when bromide of potassium and choral have failed, an injection will often speedily produce sleep. A morphia injection is useful in chorea when the movements prevent sleep, and when wakefulness, by weakening the patient, increases the movements. Clifford Allbutt employs morphia injections in dyspepsia of an irritable kind, when the patient is spare, fretful, keen, hasty, or absent in manner, with a tongue too clean, red at the tip and edges, small pulse and broken sleep.

Clifford Allbutt strongly recommends a morphia injection in the dyspnœa of heart disease, and of disease of the large vessels, in the pain of angina pectoris, and of intra-thoracic tumours. By removing dyspnœa it permits sleep, and recruits the worn-out patient. It strengthens the heart, and so removes congestion of the lungs. He considers it less useful in aortic than in mitral disease. I have long employed these injections in heart disease, and can corroborate his statements. It is hardly possible to exaggerate the relief this treatment confers on a patient suffering from cardiac dyspnœa. Almost directly on falling asleep a severe sensation of dyspnœa may compel these patients to awake and sit upright in bed, and the distress from want of sleep is often harder to bear than their other serious sufferings. In such a case the comfort afforded by a hypodermic injection is almost incredible. It ensures several hours' refreshing sleep, from which the patient awakes wonderfully revived, and the dyspnœal attacks for the next twenty-four hours may be warded off. The heart, strengthened, and, in the case of mitral disease, made more regular and slow in its action, the patient's condition is not only notably relieved, but life is prolonged. It must be borne in mind that, in heart disease, the cardiac dyspnœa is often associated with another form of dyspnœa arising from dropsy of the pleura and of the lung. The dyspnœa due to this latter cause is permanent, whilst the dyspnœa due to the heart is paroxysmal, and generally occurs only on falling asleep. The hypodermic injection of morphia will not relieve permanent dyspnœa or orthopnœa—this is best treated by incisions into the dropsical legs, [illegible] drain away the fluid. In cardiac dyspnœa a sixth of a grain hypodermically twice or three times a week is often sufficient, but the dose and frequency in severe cases may have to be gradually increased to a quarter of a grain each night. Doctors are often afraid to administer morphia in the case of a patient propped up in bed, with livid ears, nose and nails, with distended jugulars and dropsical extremities, with weak, frequent, and irregular pulse. They dread lest the morphia should weaken the heart, make the patient worse, if not kill him outright. This fear is quite groundless, and this treatment may be employed without any apprehension of injury to the patient, even if in rare instances it should fail to benefit.

Dr. Spender employs morphia injections to arrest the severe vomiting of pregnancy and other obstinate and dangerous forms of vomiting. An injection often arrests persistent hiccough. Sometimes it arrests puerperal convulsions; it has been successfully employed in tedious labour, produced by a rigid os uteri.

Dr. T. J. Gallagher, of Pittsburg, and more recently Dr. John Patterson, of Constantinople, have witnessed great benefit from the hypodermic injection of morphia in cholera, even in the stage of collapse. The cramps and vomiting cease, the patient falls asleep, the skin gradually becomes warm, and the pulse returns. They employ one-fourth to one-eighth of a grain of morphia, and usually one or two injections suffice. In the early stages the patient falls asleep, and wakes almost well. Dr. Patterson has employed this treatment for children. Many subsequent observers, however, deny the efficacy of hypodermic injections of morphia in Asiatic cholera.

A small hypodermic injection of $\frac{1}{50}$ to $\frac{1}{80}$ of a grain of morphia is most useful in the choleraic diarrhœa of children; the sickness and vomiting cease, the surface becomes warm, the child falls asleep, and wakes well-nigh cured. I have often seen hypodermic injections cure sporadic English cholera promptly, checking at once cramp and inducing sleep, the patient waking free from sickness or diarrhœa.

Dr. Braithwaite has successfully given small doses of morphia hypodermically in hæmoptysis.

A hypodermic injection of morphia, as Mr. Hunter has pointed out, is sometimes very useful in melancholia. I have seen a patient dreadfully depressed, without appetite, with weak and tottering gait, become himself again within five minutes after the administration of an injection. His depression and weakness had left him, his natural expression had returned, and he was able at once to take a walk of several miles, and return home and eat a good meal. It is a most difficult question to decide whether in such a case the doctor is warranted in permitting the injection, lest the patient become the victim of the opium habit. But I must confess that, after seeing the wonderful transformation it has caused, and how the patient has passed from utter wretchedness to happiness and serenity, I have not been able to prohibit its use.

In delirium tremens, opium, as has been said, does good service by producing sleep; it answers best when employed hypodermically. If given by the mouth and the patient is strong, the delirium boisterous, the pulse full, tartar-emetic or tincture of aconite may be added to the opium as in other cases of delirium, *e.g.*, of fevers. It is often convenient to administer the opiate with porter or spirits, this combination apparently heightening its action, whilst at the same time the delirious patient takes it more readily. It has been already mentioned that opium sometimes acts more efficiently in delirium tremens when given by the rectum. In delirium tremens it is well known that the effects of opium vary greatly, a moderate dose, even, producing sometimes a fatal sleep. This variable effect depends often on the condition of the kidneys, which in drunkards and tipplers are so often diseased. In Bright's disease therefore, because of the state of the kidneys it is necessary to give opium with caution, *not that the disease contra-indicates it*, on the contrary, it is often useful; since however, in Bright's disease, the opium often acts with unusual power, it must be given at first in small dose to test its effect. Hence before giving opium or morphia, in delirium tremens, the urine should be tested for albumen.

Many cases of acute mania may be treated satisfactorily by opium and tartar-emetic. (*See* Chloral.)

Laudanum, especially when mixed with tincture of nux vomica, is very serviceable in some of the distressing symptoms which afflict hysterical women, or nervous, overworked, anxious men. Both men and women, but chiefly women about forty or fifty years of age, are apt to complain of a sensation of great weight and heat on the top of the head, with frequent flushings of the face, suffusion of the eyes, hot and cold perspirations, and sometimes shooting pains passing up the back of the head. The pain centres occasionally in one brow, with much heaviness and torpor after meals; now and then the sensation is as of a tight cap on the vertex, or a dull aching pain in the same part, with inability to fix the attention, and much depression of spirits. These symptoms may generally be traced to a variety of causes, such as dyspepsia, especially the flatulent form, heartburn, uterine derangements of various kinds, or unhygienic conditions. In any case, however, a drop of laudanum, with two of the tincture of nux vomica, repeated three or four times a day, will generally dissociate the foregoing symptoms from the disease with which they are connected, to the great relief of the patient.

Opium is often of signal use as an anti-spasmodic. Its actio this respect, as well as its narcotic power, is much enhanced if with a diffusible stimulant, such as alcohol, ether, or chlorofo

Laudanum or morphia is of marked service in the conv of whooping-cough. The dose given to a child should be sufficient to produce very slight heaviness, which state should be maintained by giving one-fiftieth of a grain of morphia every three or four hours, or a proportionate dose every hour. A quarter of a drop, up to two drops of laudanum, according to the age of the child, must be given every hour. This treatment often removes the whoop quickly, and reduces the severity and frequency of the cough, but in the case of the presence of an irritation, such as teething, worms, tuberculosis, or much bronchitis, this remedy, like most others, is of little or no use.

Opium and its preparations are beneficial in renal and biliary colic. Morphia answers best when employed hypodermically. If administered by the mouth, small doses of the opiate, combined with spirits of chloroform, should be administered every five or ten minutes, till the pain gives way.

Opiates are also used in spasmodic stricture.

Opiates are beneficial in cases of asthma, yet in some asthmatics morphia will induce a paroxysm of dyspnœa. In bad attacks, a hypodermic injection of morphia is the most powerful way of administering the drug.

Scanzoni finds the hypodermic injection of morphia very useful in uræmic convulsions.

Dr. Anstie insisted strongly that opium acts chiefly in virtue of its stimulating action, and that as a stimulant it relieves neuralgia, also that it is not necessary to give narcotic but only stimulant doses. This view has lately been urged by Dr. Pope, of New Orleans, who attributes the usefulness of opium in fevers marked by great prostration to the stimulating action of the opium, and not to its producing sleep. He recommends the hypodermic use of morphia in the debility consequent on onanism.

I have often seen morphia, given hypodermically, useful in cases of the following kind:—A hysterical patient suffers acutely from flitting neuralgia, attacking now one nerve and now another; she is greatly depressed mentally and physically. In such a case the hypodermic injection of morphia sends a glow throughout the body, reaching even the fingers and toes, the cold extremities at once become warm, the neuralgic pains disappear, and the mind and body become invigorated; these effects last several hours. Again, I have seen the hypodermic injection give great comfort in a case of this kind:—A man suffers from melancholia, is disinclined to exercise, and has loss of appetite. After a morphia injection the depression of spirits clears off, the patient becomes cheerful and chatty, the appetite returns, and he is able to take a long walk without fatigue. In such cases, no doubt, we see the stimulating action of the opium, but this result always appears to me to depend on an idiosyncrasy, and not on the nature of the disease, for in other patients with the same symptoms the hypodermic injection of morphia fails to relieve anything but the pain, and it may even produce depression, and other very uncomfortable symptoms. It appears to me, therefore, that the stimulating action depends chiefly on an idiosyncrasy of the patient and in cases of prostration in fever I attribute the good effects of opium far more to the soothing, strengthening effects of the sleep than to the stimulating action of the opium; this conclusion is confirmed by the fact that good results do not generally follow unless the opium produces sleep.

Tincture of opium in a large dose (ʒ j.), mixed with brandy, is recommended in profuse flooding after parturition, accompanied by much exhaustion of the uterus.

Dr. Graves has rightly insisted that when an opiate is given as a hypnotic attention should be paid to the time of its administration. It should be given at the usual time for sleep, or when the patient feels inclined to doze, so that the medicine may come in at the right moment to the aid of nature; smaller doses given then are more effectual than when given at a less seasonable time. For example, in chronic wasting disease, accompanied by hectic, the opiate should be given very late at night, for in hectic there is often no inclination to sleep till the early morning hours. Opium requires ordinarily about one or two hours to produce its narcotic effects. Chronic sleeplessness, independent of any distinct disease, should not be treated with opium if it is possible to avoid it. Dyspepsia and uterine derangements are constant causes of sleeplessness, these should be treated directly, and for any residual wakefulness, chloral and bromide of potassium will be found much better agents than opium; these drugs will also be found more serviceable than opiates in insomnia pure and simple.

Opium will, of course, relieve or abolish pain; yet in the treatment of chronic cases it is right to exhaust first all other methods of treatment, for the opiate soon loses its influence, and has to be given in increasing quantities, until the patient, having become accustomed to it, is unable to discontinue it without great discomfort, even after the permanent removal of the pain.

Opium, especially when employed hypodermically, often relieves pain, and ensures sleep in acute rheumatism.

Opium is very useful in diabetes, to control inordinate appetite; the diminution of the quantity of ingested food reduces the kidney secretion, and abates the troublesome thirst. It was at one time thought that this was the only way in which opium proved useful in diabetes, but it has been shown that large doses, frequently repeated, will greatly lessen, and, indeed, remove the sugar from the urine, the
and the appetite remaining unchanged. Opium, indeed, and
are the most powerful agents which we possess for con
morbid metabolism, and very large doses of the whole d
alkaloid may be taken with great benefit, and without
of any of the symptoms proper of opiates. In these

often appears to possess real stimulant powers. Opium may be given in doses of 2–5 grains three or four times a day; morphia may be given up to 5 or 6 grains per diem. It is generally agreed that morphia is much more powerful in this disease than codeia.

Opium and its preparations check the secretion from all the mucous membranes of the body, and on this account they are given in bronchitis, and in diarrhœa to check excessive secretion of mucus and pus; they serve, of course, other purposes as well by controlling cough and excessive peristalsis.

Opiates are employed as diaphoretics.

It is well known that opium, in small or moderate dose, taken at night, if resorted to at the commencement of the attack, will cut short a cold in the head. Some attribute its efficacy to the influence on the skin, and Dover's powder is very generally the preparation selected, but two or three drops of laudanum, taken at bedtime, are often sufficient at once to abolish a threatening attack of cold in the head: a glass of hot grog assists the action of the opium.

Ten grains of Dover's powder at bedtime will generally check the night sweats of phthisis, and other exhausting diseases, even when other remedies, such as zinc, have failed.

The preparations of opium diminish the water and the urea of healthy urine, probably by lessening the appetite and hindering digestion. Morphia passes away partly by the urine.

Under the influence of opium the urine is sometimes retained for several days in the bladder.

It is important to bear in mind that the active principles of opium pass out with the milk, so that a child at the breast may be dangerously affected by opium given to its mother.

Individual peculiarity, disease, age, custom, sex, modify the action of opium.

We have already spoken of individual peculiarity. Mr. J. Brown has shown that there is sometimes hereditary susceptibility to certain drugs, such as opium and mercury.

It is well known that very large doses are tolerated in some diseases, and especially in cases in which there is severe pain.

Age influences the action of all medicines, but in an especial degree that of opium. That a dose of a medicine should act far more powerfully on the young than on the old is obvious, for since after absorption it becomes mixed and diluted with the total mass of the blood the dilution must, of course, be greater in adults than in children. Other things being equal, therefore, the dose of any drug must, as a general rule, be proportioned to the weight of the individual, provided that there is no undue development of fat. Opium, however, is disproportionately active in the [illegible] so great is the power of opium over individ [illegible] re must be taken in its administ [illegible]

The influence of custom on the action of opium has already been mentioned.

Opium, it is said, influences women more readily than men, particularly as regards its exciting effects.

As compared with opium, morphia is said to be less stimulating, less constipating, less diaphoretic, and less liable to produce headache and nausea.

Morphia produces occasionally an eruption, sometimes resembling measles, at other times like nettle-rash. It may be accompanied by distressing itching, sufficient at times to counteract the anodyne properties of the medicine.

Some writers extol the narcotic virtues of codeia, asserting that, unlike opium, it produces calm sleep without disordering digestion, exciting nausea, constipating, or producing headache; other observers, however, consider it useless as a narcotic. It may be used in diabetes but is less powerful than morphia.

Narcein has been much recommended as a hypnotic and sedative. It is said to be more efficacious than morphia, and to produce no headache, to induce less perspiration, not to constipate, nay, in large doses to purge, that it rarely excites vomiting, though nausea and loss of appetite may follow its use. One observer computes that narcein is four times weaker than morphia. It is stated that narcein is the only alkaloid of opium which does not produce convulsive movements.

Dr. J. Harley considers narcein to be a pure hypnotic, much feebler than morphia, and of very little use in medicine, its insolubility rendering it unfit for subcutaneous injection. Having tested it both by the mouth and hypodermically, Dr. Fronmüller asserts that narcein possesses no narcotic properties, a dose of 20 grains by the stomach producing no sleepiness nor any effect on the respiration, pulse, heat of skin, urine, or pupils.

Narcotine, in doses of one to three grains, is asserted to possess antiperiodic properties, some considering it to be even superior to quinine in ague.

Very conflicting statements are made regarding other properties of narcotine. Eulenberg, Charvet, Fronmüller, and others, assert that small doses increase the frequency and the strength of the pulse, but, after a time, make it irregular, also that they increase the frequency of the respirations and raise the temperature. Small doses, they say, are not narcotic. Schroff says that doses of 0·06 to 0·12 grammes produce symptoms resembling the first stage caused by a usual dose of opium, but without affecting the pupil or producing nausea. Fronmüller asserts that fifteen to thirty grains produce sleep, but Bailey gave sixty to one hundred and twenty grains without inducing sleep.

Papaverine is said to possess strong narcotic properties without inducing a previous stage of excitement, and that its action is not followed by headache or giddiness. It contracts the pupil, and when it causes sleep, reduces considerably the frequency of the pulse to the extent even of twenty to thirty beats. Fronmüller finds that it is a narcotic, and that it dilates the pupil—the pulse, respiration, and temperature remaining unaltered. Hoffman, in some experiments on himself, could not obtain these results.

The statements concerning the action of the opium alkaloids are most contradictory; this is due, probably, in part to the use of impure preparations, or to the employment of a mixture of the alkaloids, in part to the fact that the action of these substances on animals is different to their effect on man. Thus, whilst, as regards man, morphia is the most powerful alkaloid, it is, according to Bernard, as regards animals, fourth on the list. Thebaia is, to animals, the most poisonous alkaloid, but on man its action is much less marked; again, it is said that in respect of animals narcein is the most soporific of the alkaloids, but on man its action is far less than that of morphia.

When opium and morphia are taken, not for the relief of symptoms, pain, etc., but for their own sake, viz., for the stimulation and pleasurable effects which they produce, a condition known as the opium or morphia habit is established. So long as either drug is taken for the abolition of a symptom only, *e.g.*, pain, it may be persisted in for long periods, months or longer, and apparently without detriment or the establishment of a habit or craving.

Once the latter is established, both body and mind suffer; in respect of the latter it is the character more than the intellect which suffers shipwreck. The damaged nutrition of the body shows itself in the gradual development of anæmia, wasting, and cachexia.

The treatment of the craving consists in the withdrawal of the drug, suddenly or within a few days—7 to 10. We incline to recommend the sudden withdrawal as upon the whole less distressing; individual cases of extreme depression of health would have to be dealt with on their merits. The patient requires careful watching by day and night during the early period of the abstinence; it is therefore essential to have a day and a night nurse. The chief danger is from the intense depression of mind which is produced, which causes the patient to be irresponsible for the time being; bodily collapse is also a danger. Excessive perspirations, diarrhœa, vomiting, anorexia, insomnia may all be present.

The further treatment must be supporting, in particular dietetically; alcohol may be used in moderation, to be withdrawn on the earliest opportunity, since these patients easily acquire the alcohol habit. The other symptoms are treated on ordinary lines. For the insomnia Whitla advises the use on alternate nights of paraldehyde and sulphonal. The use of cocaine, hypodermically, is very questionable, for again a habit may be established; by the mouth it might on occasion be called for.

NUX VOMICA, STRYCHNIA, BRUCIA ; THEBAIA

THE three alkaloids, strychnine, brucine, and thebaine, appear to exert a similar action on the spinal cord, so that, for convenience sake, they are grouped together; but it should be stated that strychnine is more powerful than brucine, and brucine than thebaine. Our succeeding remarks apply mainly to nux vomica and its alkaloids, as thebaine has not yet been put to any therapeutic application.

The preparations of nux vomica have an intensely bitter taste, and, like other bitters, augment the flow of saliva.

They produce a sensation of hunger, but there is no evidence that, in a healthy person, either strychnine or any other bitter substance increases the digestive power. Like other bitters, and, perhaps, in a greater degree, these preparations, by their slight irritant action, check unhealthy conditions of the gastric mucous membrane, and may in this way promote digestion. The action of bitters, and especially of the tincture of nux vomica, far the best and most agreeable agent for this purpose, is well shown in certain perverted conditions of the digestive canal. For example, in the course of chronic diseases, such as bronchitis, dilated heart, or cirrhosis of the liver, the tongue, not unfrequently, becomes thickly coated with a white fur, and the symptoms indicate chronic catarrh of the stomach : one or two drops of the tincture of nux vomica in a teaspoonful of water, every two hours, or oftener, for twenty-four to forty-eight hours, will often clean the tongue, improve the digestion, and, at a critical time, clear the way for the administration of nourishment. Again, during early convalescence, when the tongue still continues coated, and the digestion weak, nux vomica will prepare the way for stronger tonics and a more liberal diet.

This treatment greatly mitigates the annoying flatulence and indigestion, occurring in cases of mechanical obstruction to the circulation in the digestive organs, as from cirrhosis of the liver and dilated heart; indeed, nux vomica is more or less serviceable in flatulency of any kind. Heartburn, also, yields frequently to small quantities of the tincture, given three or four times a day.

Nux vomica is of great service in a group of symptoms, which include weight at the pit of the stomach after food, acidity, and heartburn, also flatulence, accompanied by heat and weight at the top of the head; the last symptom occurs frequently in women, especially about middle age. This dyspeptic condition is often benefited by five drops of the tincture of nux vomica taken about a quarter of an hour before food, three times a day. The heat and sensation of weight on the top of the head, even when occurring independently of any gastric disturbance, often yields to the same treatment.

In acute gastric catarrh, accompanied by "sick headache," the action of tincture of nux vomica is sometimes very marked. This common and troublesome complaint is sometimes traceable to error in diet, or to constipation, but it occurs often without any apparent cause. Headache is often the most prominent symptom, the nausea being very slight, and amounting to mere qualmishness. A drop of the tincture in a teaspoonful of water, taken every five or ten minutes, to the extent of eight to ten doses, and then continued at longer intervals, will often quickly mitigate, and in a few hours remove, this kind of headache, which otherwise might continue all day.

The tincture or extract of nux vomica has long been employed to correct constipation, habitual or temporary. The extract, mixed with other remedies, such as rhubarb or colocynth pill, should be taken, daily, shortly before dinner, to aid digestion, and the proper unloading of the bowels. The same effect may often be obtained by giving one or two drops of the tincture twice or three times a day. As our knowledge of the action of nux vomica in its relation to constipation is at present imperfect, the results appear to be capricious. It is as well, therefore, not to be too sanguine of success, for whilst in some cases it answers beyond all expectation, in other, apparently similar, cases it fails completely. If the bowels are habitually sluggish, the patient should take occasionally, early in the morning, half a tumblerful of some natural purgative water to assist the nux vomica. Should the constipation be due to insufficient supply of bile, the motions being pale in colour, nux vomica will fail, and other medicines will be required.

Strychnine, as Sir W. Savory has shown, is much more poisonous when injected into the rectum than when swallowed, a curious difference, not due to the digestion and destruction of the alkaloid by the gastric juice, since he has proved that this secretion exerts very little, and probably no effect, upon strychnine.

Strychnine enters the blood quickly, as is shown by the rapidity with which a poisonous dose is followed by characteristic symptoms. Moreover, the alkaloid can be extracted from the blood and urine, a conclusive proof of its absorption.

A large and poisonous dose produces symptoms very closely resembling those of tetanus. The symptoms usually come on in from twenty minutes to half an hour, and are rarely delayed beyond the hour. The first symptoms are general uneasiness, with restlessness and soreness of the limbs. Shooting pains like electric shocks occur in various parts of the body, often in the back first, and then down the arms and legs. Tetanic and paroxysmal contractions of the muscles soon set in, and these symptoms grow rapidly worse, and make the body rigid while the paroxysm lasts. The first paroxysm may be very severe. The respiratory movements may be so completely arrested, that the face becomes bloated and livid, the jugular veins stand out in the neck, the eyes become staring and prominent, the jaws are firmly clenched, and the pupils dilated. Each spasmodic attack will last from a few seconds to a minute or more, and then generally ceases altogether for a time. Throughout the paroxysms, the mind is quite unaffected, and the patient's sufferings are hence the more agonizing. A breath of air, a slight noise, a movement of the bed-clothes, the most trivial cause, may excite the tetanic spasm. In a fatal case death is rapid, but if the patient survive for two or three hours, sanguine hopes may be entertained of recovery. A fatal termination may be due either to exhaustion from the repeated convulsions, or to asphyxia from spasm of the muscles of the chest. The muscles of the jaw are usually the last to be affected.

Brucine, thebaine, and many of the opium alkaloids affect the body in the same way.

The symptoms of strychnine poisoning differ from those of tetanus in the following particulars:—From the first the poisonous symptoms of strychnine are very strongly marked and rapidly reach their worst; perfect intermissions occur; death soon takes place, or the symptoms decline rapidly, and the patient recovers. Fatal doses of strychnine raise the temperature of dogs from 4° to 6° Fah.

Treatment of poisoning:—*Stomach pump*, if available in time; after tetanic symptoms have set in the introduction of the tube would excite a paroxysm, and therefore would not be applicable; *animal charcoal*; tannin; solution of iodine; *chloroform inhalation*. One of the best methods is the combined use of *bromide of potassium and chloral*, in large and frequently repeated dose, *e.g.*, half an ounce of the bromide with 30–60 grains of chloral, at once, in a severe case, and subsequently 2 drachms of bromide with 15 grains of chloral every twenty minutes, if necessary. Other methods are, the injection of curare, or of methyl and ethyl compounds of strychnine, of brucine, or of thebaine; artificial respiration; fats.

Leube and Rosenthal find that pulmonary insufflation arrests strychnine tetanus by increasing, as they suppose, the absorption of oxygen. Brown-Séquard confirms these statements concerning insufflation, but contends that the arrest of convulsions is due to the mechanical effect produced by the forcible impact of the air upon the ramifications of the vagus, in the brónchi, and upon the nerves of the diaphragm exciting a reflex inhibitory action; section of the cord above or below the origin of the phrenic nerves and section of the vagi prevent the action of insufflation.

Strychnine excites tetanus, through the spinal cord and not through the brain, for in poisoning by strychnine, the mind, to the last, remains unaffected, and between the paroxysms the animals can execute voluntary movements. Nor does it tetanize through the muscles or nerves, for after division of one sciatic nerve, strychnine excites tetanus in every part of the body except in the limb supplied by the divided nerve, yet inasmuch as the vessels of this limb are undivided, its muscles and nerves are as much poisoned by strychnia as those of the rest of the body. As then strychnine tetanizes neither through the brain, nor through the muscles or nerves, it must act through the cord. This conclusion is confirmed by the following experiments: (1) If the cord is cut and all the vessels supplying its posterior part tied and the animal is then poisoned, convulsions occur in the anterior portion of the body, but simple normal reflex acts follow stimulation of the posterior parts of the body, that part indeed which is under the control of the portion of the cord which is protected from the poison by ligature of its vessels. (2) If all the blood is allowed to drain from the body of a frog by section of its heart, and a small quantity of strychnine is then placed on the anterior part of the cord, which has been laid bare, the anterior parts of the body become speedily tetanized, and this condition slowly extends to the posterior parts as the strychnine descends and affects the rest of the cord.

Dr. G. Walton finds that strychnine, in dose sufficient to produce tetanus, affects the cord so that any stimulus capable of producing a reflex contraction produces a maximal contraction, provided a certain time has elapsed since the preceding stimulation. The necessary interval varies with the degree of poisoning, being a few seconds only, when the frog is strongly poisoned. During this interval the degree of contraction depends on the strength of the stimulus. All the contractions subsequent to the ending of the interval are tetanic. In strychnine poisoning there is no summation of stimuli, the behaviour of the strychnized cord thus differing strikingly from the unpoisoned cord. The minimal stimulus, capable of producing a reflex movement, becomes less and less as the poisoning effect increases, *i.e.*, the cord becomes more and more sensitive. The motor and sensory nerves are, Dr. Walton finds, unaffected by strychnine.

After traumatic and strychnine tetanus the functions of the motor nerves and muscles are depressed, the motor nerves conveying impressions imperfectly, whilst the muscles contract imperfectly under direct galvanic stimulation and soon become stiff from rigor mortis. Kölliker has shown that this is in part due to the excessive activity these parts have been made to undergo through the strychnine; in other words, to fatigue. But strychnine, apparently, does also directly depress the motor nerves, for large doses may kill without exciting convulsions and the motor nerves will then, also, be found to have lost their conductivity. Moreover, if, before poisoning, the sciatic nerve is divided, thus protecting the limb from convulsions, the divided sciatic does lose its irritability too quickly, though not so soon as the undivided fatigued nerve. Again, if all the tissues of a frog's leg except the nerve are tied, and the portions distal to the ligature thus defended from the access of the poisoned blood, all parts will become tetanized, but the convulsions will cease sooner in the poisoned than in the protected leg, the motor nerves of the former having been paralyzed by the strychnia-containing blood. This is clear, for the fatigue in the nerves and muscles of each limb will be the same, and any difference must therefore be due to a direct action of the poison upon the peripheral structures of the unprotected limb.

Harley's experiments show that the poison acts on all parts of the spinal cord, its effects on this organ appearing to be twofold. It dilates the vessels, thus increasing the supply of blood, and it also augments the activity of the functions of the cord.

It is stated that traumatic and strychnine tetanus produce minute ecchymoses in the cord. This is not the case with frogs tetanized by strychnine, for these animals may be tetanized for weeks without the production of ecchymoses—a fact which proves that ecchymoses are the result and not the cause of tetanic spasms.

It seems worthy of remark that strychnine does not merely heighten the reflex action of the cord, but that it so affects it that impressions are not confined within their natural limits, but diffuse themselves throughout the cord; strychnia, in fact, *lessens the resistance of the cord* and increases the diffusibility of impressions. Strychnia heightens arterial pressure by stimulating the vaso-motor centre.

The late Dr. Anstie recommended the hypodermic injection of strychnine, in one-hundred-and-twentieth of a grain dose, to relieve the pain of cardialgia and gastrodynia. "There is," he says, "no such remedy for gastralgia as this."

Mr. Charles Hunter advises the injection of strychnine hypodermically in cerebral, spinal, and other forms of paralysis. About one-eightieth to one-sixtieth of a grain, administered twice or three times a week, will, he says, after three or four injections, almost always show if strychnine manifests any effect on the particular form of palsy under consideration. The injection produces a general warmth or glow of the skin, lasting a few hours, felt most in the paralyzed limbs, and down the spine; it removes the sensation of heaviness, or weight, and the muscular twitchings, spasms, or cramps, and may induce sweating, especially of the palsied parts. Most of these results I have myself witnessed.

Hypodermic injections, progressively increased till even one-twelfth of a grain is injected at one dose daily, are useful in essential paralysis of children and in diphtheritic paralysis.

In progressive muscular atrophy, Gowers recommends the hypodermic injection of strychnine, preferably the nitrate; "the injection may be made once a day, beginning with one-eightieth of a grain and gradually increasing to one-fortieth." He states also that he has seen the progress of the disease stayed under his treatment, "although strychnia had been given by the mouth without effect."

In multiple neuritis, especially in that of alcoholic origin, st
nine is valuable, given either by the mouth or hypodermically
Queen's Square Hospital the hypodermic use of the drug

found much the more effectual, the dose may begin at two or three minims of the liquor strychninæ, injected once a day. Dr. Brown-Séquard recommends nux vomica or strychnine in those forms of paraplegia dependent on softening and wasting of the cord, when, for example, the supply of blood conveyed to it is diminished through degeneration and partial blocking up of the vessels. Strychnine is supposed to dilate the vessels and to increase the supply of blood in the degenerated tissues, and thus to avert their further destruction.

Strychnine affects paralyzed sooner than unparalyzed muscles.

Dr. Julian Chesolm employs hypodermic injections of strychnine in eye and ear diseases, beginning with one-fortieth of a grain daily, increasing the quantity till, in fifteen to twenty days, one-sixth or one-fifth of a grain is reached; no benefit may take place till these larger doses are administered. As we meet with idiosyncrasies in respect of strychnine, it is well to begin with a small dose. He employs these injections also in muscular asthenopia, amblyopia, tobacco amaurosis, and in progressive nerve atrophy not dependent on intracranial disease. Dr. Werner finds strychnine, by injection, useful in traumatic amaurosis. Perhaps proportionately large doses given by the stomach might prove just as serviceable.

These preparations, especially the tincture, are often of much use in the so-called hysteria of middle-aged people. In many cases it appears to control the distressing flatulence commonly connected with this state, and to relieve the sensation of heat and of weight at the top of the head, and it often removes effectually, although less surely, flushings of the face, and hot and cold perspirations. It is still more effectual when combined with small quantities of laudanum.

Strychnine given hypodermically or by the stomach is highly to be recommended in alcoholism and delirium tremens. Persistently administered it prevents the recurrent craving for drink, often met with in persons who inherit the propensity direct from a drunken parent, or in whom it is the result of an altered neurosis. It must be administered in increasing doses. In delirium tremens strychnine, given hypodermically in $\frac{1}{60}$ to $\frac{1}{30}$ grain, or in even larger doses, calms excitement and induces sleep.

The late Dr. Anstie noticed that strychnine sometimes produces symptoms closely resembling intoxication, viz., unsteadiness of gait, perversion of the intellect, and a meaningless smile. On one occasion I was able to connect a peculiar wandering delirium at night with the employment of strychnine, though there were no tetanic twitchings.

In medicinal doses strychnine is said to strengthen the heart beats, and clinically it is recognised by many as an excellent heart tonic. In all cases of urgency, *e.g.* in the cardiac failure of typhoid, diphtheria or other infectious fever, it should be given hypodermically and in full dose, three or four minims repeated every four hours or so (with careful watching) according to the urgency of the case. It is useful also in the cardiac failure of valvular disease.

It has been shown that the heart of an animal poisoned by strychnine ceases to contract sooner after death than that of an animal destroyed by mechanical means; and further, that if a frog's heart is placed in a solution of strychnine it ceases to beat sooner than another placed in simple water. It is not said whether the organ ceases to contract in the systole or diastole. Harley states that when a solution of strychnine is dropped on a heart its muscles become tetanic. The same authority says that both strychnine and brucine lessen the absorption of oxygen and the production of carbonic acid, in other words, they lessen the respiratory function of the blood, and if either alkaloid is mixed with blood recently drawn, the amount of oxygen it absorbs and of carbonic acid it gives off, are less than in the case of simple unaltered blood. But is it not probable that any substance capable of altering the physical or chemical condition of the blood will lessen its respiratory functions, and do these experiments therefore help us much to elucidate the effects of medicinal doses?

According to Dr. Anstie, strychnine promotes the capillary circulation, and he recommends it in troublesome coldness of the hands and feet.

Strychnine stimulates the respiratory centre, and clinically, when given in full doses, it is found of much service in chronic bronchitis and emphysema.

Strychnine, given to a rabbit with young, causes abortion; therefore it has been stated that this drug possesses a direct influence over the uterus, but there is no evidence to confirm this conjecture.

Strychnine is useful in prolapsus ani, and if this condition is associated with constipation, the drug may be added to a purgative such as tincture of rhubarb. If diarrhœa occurs, this should be checked, and the prolapsus will probably cease, but if not, strychnine will generally succeed quickly in ridding the child of this troublesome complaint.

Strychnine sometimes induces persistent erections, which phenomenon has led some doctors to give it in impotency and spermatorrhœa, and, indeed, large doses of strychnine are sometimes useful in spermatorrhœa, especially when associated with impotence.

Strychnine is sometimes employed with much benefit in paralysis of the bladder of old people when the water keeps constantly dribbling away. It may also prove useful in the incontinence of urine of children.

Strychnine is separated in part, at least, by the kidne
fluence, if any, on the urine, has not yet been ascertaine

In a remarkably able paper, Drs. Crum Brown ar
recorded some experiments made with methyl and etl

strychnine, brucine, and thebaine, and the astonishing results at which they have arrived. While retaining most of the chemical properties, in fact giving the ordinary reactions of strychnine, brucine, and thebaine, the physiological action of these substances on the body is completely altered. These observers experimented with iodide of methyl-strychnium, sulphate of methyl-strychnium, and with the nitrate and hydrochlorate of the same base, and likewise with the iodide and sulphate of methyl-brucium, and with the iodide and sulphate of methyl-thebaium.

As we have already stated, strychnine, brucine, and thebaine affect the cord, and produce according to the dose, more or less severe tetanic convulsion. But these alkaloids, when converted into the ethyl and methyl compounds, cease to act in this manner, and produce general paralysis of the body by an action upon the ends of the motor nerves. These new compounds indeed act on the body in the same way as curare.

In their action upon the heart and muscles these new substances were likewise found to differ much from strychnine, brucine, etc.; for after poisoning by the methyl or ethyl compounds the heart continued to contract naturally for a long time, and the skeletal muscles continued for many hours flaccid, contractile, and alkaline.

Drs. Crum Brown and Fraser experimented further on codeine, morphine, and nicotine. At the conclusion of their treatise they say:—

> "The change in the character of the physiological action is remarkably illustrated by strychnia, brucia, and thebaia, whose purely spinal tetanic action is converted into a paralyzing action on the periphery (end-organs) of motor nerves; it is apparent in codeia and morphia, whose convulsant action is also converted into a paralyzing action on motor nerve end-organs, and whose hypnotic action is apparently altogether destroyed in the case of codeia, and certainly greatly diminished in that of morphia; and it is obvious, though less so than with the others, in the case of nicotia, whose convulsant action is diminished, if not altogether removed. We may conclude from these facts that when a nitrogen base possesses a strychnia-like action, the salts of the corresponding ethyl and methyl bases have an action identical with that of curare.
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> "It is well known that curare and strychnia are derived from plants belonging to the same genus, and it is therefore interesting to observe such a relationship. It may not, however, be altogether superfluous to add that strychnia, brucia, and the other spinal stimulant alkaloids examined in this paper have not been converted by chemical addition into curarina—the active principle of curare. The action of the methyl derivatives of these bases is of precisely the same character as that of curare, and they possess the same peculiarity of slow absorption by the mucous membrane of the digestive system, but the degrees of their activity are very different. If we confine our attention to the salts of the methyl derivatives of strychnia, brucia, and thebaia, where the action is uncomplicated, we observe they form a series in which the fatal dose varies for each, while this dose, in the case of the most active of the three, is considerably above that of curare and

greatly above that of curarina. Besides, curarina has a characteristic colour reaction that belongs to none of these bodies, each of which possess special colour reactions, by which they may be distinguished from each other."

There is a distinct antagonism between strychnine and Calabar bean and between strychnine and chloral. These antagonisms have lately been investigated by a committee presided over by Dr. Hughes Bennett. Previous experimenters have shown that Calabar bean modifies strychnine tetanus, but that it is of no avail to save life, and Dr. Bennett's committee confirm these conclusions, showing, as they do, that whilst the symptoms induced by strychnine, *e.g.*, tetanic convulsions, are modified by Calabar bean, the latter, so far from saving life, actually helps to destroy it, for, when both poisons are administered together, but each in quantity less than the minimum fatal dose, their combined action in this dose is fatal.

The antagonism between chloral and strychnine is far greater, chloral modifying the strychnine symptoms to a great extent; as might be expected, the sooner chloral is given after strychnine the greater is the antagonistic effect. Very large doses of strychnine require very large and even dangerous doses of chloral to antagonize them. Whilst chloral antagonizes strychnine, it is doubtful if strychnine will avert death from chloral, for whilst chloral produces profound coma, and destroys life by its action on the cerebral hemispheres, strychnine does not affect these parts.

LOBELIA INFLATA

THIS remedy has been highly extolled, and as strongly depreciated, answering with some beyond expectation, and to others yielding nothing but failure and disappointment. This discrepancy may be reconciled easily, for it will be found that lobelia has been recommended in very different doses by two sets of authorities. According to the one, the remedy, unless given in large doses—doses deemed even poisonous by some—is inoperative; according to the other, lobelia is a highly poisonous and dangerous drug, to be given only with much caution and close watching: it is these last who have failed.

Lobelia contains an alkaloid lobeline.

Lobelia first raises and then depresses blood-pressure. Large doses paralyze the vaso-motor centre and the peripheral ends of the vagi. The drug kills by paralyzing the respiratory centre. The action upon the respiratory centre is the most important action; in the early stages this centre is stimulated. The heart continues to beat after failure of the respiration.

The vomiting centre, like the respiratory, is primarily stimulated, hence the vomiting in man and mammals.

In fatal cases death ensues in a state of marked collapse, with complete muscular relaxation and lowering of the body heat. Convulsive seizures may occur.

In many respects the action of lobelia resembles that of tobacco.

Lobelia is of great service in many cases of asthma, whether accompanied or not by visible structural changes in the lung. It is useful in the peptic, but especially in the bronchitic form of asthma. These two forms are generally more or less mixed, the tightness of breathing in bronchitic asthma being increased by food, and the peptic asthma leading after a time to emphysema and bronchitis. Lobelia is, I think, less useful when the attacks come on periodically, at intervals varying from about three weeks to a month. It may, indeed, for several days, postpone or partly suppress the paroxysm, but after a time the lobelia is apparently unable to prevent the attack. My experience leads me to esteem lobelia higher the more I try it, and I frequently hear it extolled by patients. It must, however, be confessed that in some cases it fails entirely. In the bronchitic form patients often say it "helps them to get up the phlegm." It is hardly necessary to observe that lobelia is not useful in all forms of dyspnœa; it is useless when this depends on heart disease, and when the difficulty of breathing comes on only from exertion, or from a bad fit of coughing. Lobelia being only palliative and not curative of the conditions causing the dyspnœa, it should be given only during a paroxysm. On any signs of an oncoming fit the medicine must be taken immediately in doses of a drachm of the simple tincture every hour, or even every half-hour, or ten drops may be taken every ten minutes or quarter of an hour until the dyspnœa gives way. It is better to adopt the smaller and more frequent dose, as the medicine can be discontinued should sickness or depression occur. The great drawback is its uncertain action, some patients being made sick and faint by doses which others take with impunity. The risk of depression is obviated by the small and frequent dosage, and a patient soon learns both the suitable dose and the suitable periods. It is well to inform patients of the possible occurrence of sickness and faintness, symptoms which may make them feel very ill, but these soon disappear, and never, so far as I have seen, become serious or dangerous. I have repeatedly given two-drachm doses without any dangerous consequences, but this large dose generally excites a sensation of sinking at the stomach, with nausea, and, not unfrequently, with vomiting. When the patient complains of more or less constant tightness of the chest, with frequent exacerbations during the day, he should take ten minims of the tincture thrice daily, with an additional dose on the occurrence of the exacerbation. In bronchitic asthma, where the breathing is a little tight all day, but much worse at night, the patient should take ten minims three times a day, with additional doses according to the state of the breathing at night.

Lobelia should be given cautiously to asthmatics with heart disease, or it may render the pulse irregular and very weak. Lobelia inflata allays the dyspnœa which accompanies capillary bronchitis in emphysema.

In certain epidemics of whooping-cough lobelia is very serviceable, whilst in other epidemics it seems useless. Lobelia is useful in the spasmodic stage, and in two or three days generally reduces by one-half the frequency of the attacks, lessening their severity at the same time; the speedy subsidence and disappearance of the whoop attest the influence of this drug. Like all other whooping-cough remedies it acts best in uncomplicated cases, and when the weather is warm and mild. If the weather is cold, and the winds cutting and sharp, the child should be confined to a warm room, but under other circumstances it should live as much as possible in the open air. For a patient two years old I order ten minims of the tincture of lobelia every hour, and an additional dose each time the cough is imminent, provided the paroxysm gives sufficient warning. Children bear large doses of the drug, for in no instance have I witnessed nausea, sickness, faintness, or any ill effects follow the doses just recommended. I find, indeed, that adults are much less tolerant of lobelia than children. Sometimes lobelia produces a slight burning sensation in the throat. Whooping-cough is well known to be a very obstinate and dangerous affection in infants only a few months old, and in such cases lobelia often appears to do less good than to older children. Even to the very young I give five minims of the tincture every hour.[1]

Lobelia has been recommended in bronchitis, and I have tried it in several cases, but while it removed any paroxysmal dyspnœa, it appeared to be powerless over the bronchitis itself. It has been employed in laryngismus stridulus and in croup.

In the Pharmacopœia we have two tinctures, the simple and the ethereal; they are of equal strength, and are given in the same doses. A useful combination, in asthmatic affections, is obtained by giving iodide of potassium and opium along with lobelia.

The natural affinities of lobelia are with tobacco and gelsemium. Therapeutically it stands, like stramonium, as a drug having special powers over asthma and allied spasmodic affections of the respiratory system.

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[1] Mr. Foster, of Huntingdon, and Dr. Howard Sargent, of Boston, America, have recommended clover in whooping-cough. Dr. Sargent gives occasionally through the day a wine-glassful of an infusion made with two ounces of the carefully-dried blossoms of red clover, steeped for four hours in a pint of boiling water.

CANNABIS INDICA

INDIAN HEMP does not affect all persons similarly, and race and climate are supposed to modify its influence. Its effects are most marked on the brain, the functions of which it more or less perverts in various ways. It generally produces a pleasurable intoxication, and the dosed person becomes talkative, or sings, or perpetually giggles, objects often assuming to him very grotesque aspects, and exciting him to much merriment. He is possessed with a feeling of happiness and contentment, and ideas of a pleasing kind pass rapidly through the mind, sometimes unconnected and immediately forgotten, but in other instances recollected on the return to the normal state. Sometimes, however, there is furious delirium. After a time sleep sets in, generally accompanied by delightful dreams. In the earlier stage there may be pain in the head, "a sensation as of the brain boiling over and lifting the cranial arch, like the lid of a tea-kettle." The head often feels hot and heavy; the eyes are bright and shining; sometimes there are giddiness and noises in the ears. Among the early symptoms is a sensation of heaviness in the arms and legs. General sensibility is also affected, and pricking in the feet, or over the whole body, with numbness, often of a pleasurable kind are felt early. Pressure on the skin may excite a sense of burning. After a time, complete anæsthesia sets in to such an extent that while standing there may be no consciousness of touching the ground. The muscular sense may be lost, and pain lessened or removed. Sometimes the drug produces a condition of complete catalepsy. It often occasions a ravenous sensation, not to be appeased by food. In some instances the pulse is said to be at first rather increased in frequency and strength, but neither pulse nor breathing is much altered. It dilates the pupils, but they contract to light. Sometimes there is strong sexual desire.

Such is the group of symptoms induced by Indian hemp, though they do not all occur in the same person, but are variously combined; sometimes the sensations are anything but pleasant, viz., nausea, vomiting, great thirst, frequent, weak, and intermittent pulse, with disagreeable sensations and ideas, at times of the nature of a great horror or dread or despair.

If indulged in for long, as is common in the East, Indian hemp produces loss of appetite and strength, trembling, and much mental weakness.

It is used to produce sleep, and its effects have been compared to those of opium, but it differs from this drug, it is said, in not producing nausea, constipation or headache. Fronmüller administered it in 1,000 cases, and found that it succeeded in 530; partly succeeded in 215; and produced little or no effect in 255 instances. A large dose is required to induce a hypnotic effect, *e.g.*, eight grains of the spirituous extract, which dose will sometimes soon after its administration, excite headache, vomiting, and giddiness ; the headache may be severe, dull, and throbbing, and accompanied by a coated tongue. The preparation used by Fronmüller must be far weaker than the extract employed in this country, for in some cases even half a grain of the native extract excites disagreeable symptoms.

Cannabis Indica is one of the most valuable remedies for megrim or sick headache. It appears to act on the nervous centres whence this headache springs. It has been found serviceable both in cases associated with little or no nausea, and in cases accompanied by severe vomiting. It is useful in attacks accompanied by spectra. In my experience it is most useful in preventing an attack, less so in arresting it, when once it is established. It is sometimes useful in those severe, continuous forms of headache, lasting sometimes for weeks (*see* Croton Chloral), but it is especially effective when from fatigue, anxiety, or change of life, the attacks become much more frequent; then the drug, gradually, or sometimes indeed quickly, lengthens the interval between the attacks, and at last brings them back to their old periodicity, or even extends the intervals between the seizures. It need hardly be said that cannabis will not cure these patients. I have given this drug for weeks or months continuously, in doses of one-third to one-half a grain twice or thrice daily. Inasmuch as anæmia or constipation favours and even excites attacks of migraine, and, therefore, often co-exists with it, cannabis indica may be combined in pills with either iron or aloes.

Subsequent experience has fully confirmed the favourable opinion just expressed, indeed, no single drug have I found so useful in migraine.

Not only is cannabis indica useful in the inter-paroxysmal period to prevent headaches, but a third to half a grain of the extract given at the commencement of an attack will sometimes cut short the paroxysm. In the inter-paroxysmal period I generally give half a grain of the extract three times a day, but, sometimes, especially in women, this dose induces very disagreeable symptoms; these may not occur till after several days' use of the drug.

Dr. Clouston recommends cannabis indica combined with bromide of potassium in acute mania, giving a drachm of the bromide of potassium with a drachm of the tincture of cannabis indica.

It has been found useful in neuralgia, whooping-cough and asthma, and it appears to be serviceable in some cases of hysteria. Some accord to it a high reputation as a diuretic in acute and chronic Bright's disease, and they consider that bloody urine is a special indication. It is said to relieve dysuria, and strangury, and to be useful in retention of urine, dependent on paralysis from spinal disease. It has been used occasionally in gonorrhœa.

It is very useful in menorrhagia, or dysmenorrhœa Half a grain to a grain of the extract thrice daily (a grain every two hours, or hourly, is sometimes required by those who can tolerate so large a dose) often relieves the pain of dysmenorrhœa. It is said to increase the energy of the internal contractions.

It has been also recommended in impotency.

Possibly owing to differences in the quality of the drug, but generally on account of some peculiarity on the part of the patient, we find that even half a grain of the extract will strongly affect some persons, women being more powerfully affected by the drug than men. I have known cases where half a grain three times a day was well borne, and with benefit, for many days, and then suddenly disagreeable and pronounced symptoms arose, which could not be accounted for either by the time or by the circumstances under which the medicine was taken. It is better, therefore, to begin with a quarter of a grain of the extract, at first, to test the patient's tolerance, and if this is well borne then the dose should be increased.

The late Sir Russell Reynolds, speaking from an experience of thirty years, stated that the drug was of great value in senile insomnia marked by great restlessness (fidgetiness). In such cases, he maintained that there was nothing comparable in utility to a moderate dose of Indian hemp, viz., $\frac{1}{4}-\frac{1}{3}$ grain of the extract at bedtime. In the treatment of the night restlessness of patients, with general paralysis, he found it very useful, also in the insomnia of "temper disease."

As to dose, Sir R. Reynolds pointed out the importance of securing a pure extract, and because of the great variability in strength, he advised that the *initial* dose should never exceed gr. $\frac{1}{5}$ for adults, gr. $\frac{1}{10}$ for children. The tincture he regards as the best preparation on the whole; of this 20 minims = 1 grain of the extract. He advises further that in using the tincture, one of double strength should be prepared, to be given on sugar or bread crumbs in the form of drops, so as to avoid the unequal separation of the resin which may occur when it is given in mixture. The drops (of which 4 of the B.P. strength would correspond with his minimum dose) should not be repeated in less than four or six hours; the dose may be increased by one drop every three or four days till relief has been obtained or the drug proved useless. (See Tuke's *Dictionary of Psychological Medicine*, art., "Sedatives.")

The active principle of cannabis indica appears to be an amorphous, resinous, bitter substance, called Cannabinon. There is also a volatile alkaloid named Cannabinine, and in some varieties, it appears, a strychnine-like base, called tetano-cannabine.

ERGOT

LARGE doses, even an ounce of the liquid extract, are sometimes administered immediately after delivery, without producing toxic effects. Ergot is sometimes also administered in considerable doses for a long period without in any way deranging the health, hence whilst producing powerful therapeutic effects the drug has but little toxic action.

Ergot has a disagreeable bitter taste, and it occasions an abundant secretion of saliva. In large doses it produces nausea, vomiting, colic, diarrhœa, giddiness, dilatation of the pupil, great retardation and slight weakness of the pulse, pain in the head, dimness of vision, giddiness and stupor.

Whether administered by the stomach or hypodermically, ergot contracts the arteries and greatly heightens arterial pressure. Injected into the jugular vein it produces, at first, a slight fall of blood-pressure, followed in a short time by a great rise in tension. Wood and others find that division of the spinal cord prevents the heightened tension, showing that ergot stimulates the vaso-motor centre. Dr. Sainsbury's and my own experiments show that a weak solution of ergotin in saline solution circulated through the posterior part of the body of a tortoise, whose spinal cord has been completely destroyed, greatly retards the flow of the fluid through the vessels. This experiment shows that ergot, by its influence on either the peripheral nervous system or on the muscular tissue of the blood-vessels, certainly does induce strong contraction of the arterioles.

Ergot slows and weakens the heart, hence the rise of blood-pressure in no way depends on the influence of ergot on the heart. The slowing of the heart is due to stimulation of the terminations of the vagi, for the slowing does not occur if atropia is administered before giving ergot. Large doses arrest the heart in diastole, and strong direct excitation does not then induce contraction, showing that the arrest is not due to inhibition through the vagus, but depends on the direct action of the ergot upon the cardiac muscle.

Ergot stimulates involuntary muscular fibre and so increases the vermicular action of the intestines; it induces also contractions of the bladder and of the uterus, especially in its pregnant, and still more in its parturient, condition.

Large doses induce anæsthesia and paralysis, probably through the spinal cord, for the motor nerves and muscles are unaffected. It kills by paralyzing the respiratory centre and arresting respiration.

If taken for a long time ergot is said, sometimes, to produce fatal consequences, namely, spasmodic contractions of the muscles, and now and then gangrene of the extremities, in character generally *like* senile gangrene. These statements, usually repeated in therapeutic works, must be very greatly exaggerated, as we now administer considerable quantities of ergot for weeks, or even months, without producing either gangrene or spasm. However, we meet with somewhat similar discrepancies, or seeming discrepancies, in respect of chronic lead-poisoning by small quantities and the harmlessness of large therapeutic doses, though continued for periods of some length. The gangrene which ergot may undoubtedly cause has been proved partly by experiment on animals, *e.g.*, upon cocks, the combs of these birds becoming gangrenous, partly by the well-established facts of epidemic ergotism, from the use of bread made from ergotised rye or other cereal; in these epidemics gangrene of the extremities is frequent. Sometimes the poisoning shows itself by the production of nervous symptoms, viz., cramps, contractures, epileptiform attacks, and in some cases by symptoms resembling locomotor-ataxy; in some of these last a sclerosis of the posterior columnus has been demonstrated pathologically.

Dr. Davidson has reported a singular case of poisoning by ergot. For several months a pregnant woman took large doses of liquid extract of ergot and of powdered ergot, till at last it caused death. When called to see the patient she complained of lumbar and arthritic pains, and vomited a reddish-brown pultaceous matter (blood). She passed urine looking like blood. After his visit she vomited half a pint of blood. The upper part of the body was intensely jaundiced. She had "genuine black eye." Her lips and tongue were swollen and covered with dry black blood. Her heart beat 150 per minute. After death he found numerous ecchymoses in the subcutaneous fat of the peritoneum and in the lungs. Also much blood in the peritoneal cavity and in the stomach and intestines.

Administered either by the mouth or hypodermically ergot is most valuable in hæmorrhage; indeed, in this respect few if any remedies rival its efficacy. Dr. Currie Ritchie and Dr. Drasche were the first to use it hypodermically, and they reported of its successful use in cases of hæmoptysis, epistaxis, hæmatemesis, and in intestinal hæmorrhage in typhoid fever; many other observers have since confirmed their statements. In severe bleeding, when it is urgently necessary to check the loss at once, the hypodermic injection of from two to five grains of ergotin must be practised. I have seen this injection in many instances produce a good deal of swelling and pain, which, however, has always subsided without suppuration. It is well to warn the patient that this temporary untoward accident may occur. No irritation arises if the injection is made into the muscular tissue instead of the connective tissue, a deep injection will therefore avoid this trouble. In less urgent bleeding, administration by the stomach is very successful. It is very useful in hæmoptysis, in doses of thirty or forty or even sixty minims of the liquid extract every three or four hours; in severe cases indeed it may be given hourly.

Ergot is strongly recommended in purpura.

Hildebrand advised the hypodermic injection of ergot for fibrous tumours of the womb, a curious measure, but one which has been endorsed by Drs. Keating and Ashurst, distinguished American physicians, who state that injections of five to six grains of ergotine at intervals will greatly diminish the size of fibrous tumours. In a case reported by Dr. Keating the pulse, respirations, and temperature fell for a time after each injection, the fall increasing with each injection; thus, after the fifteenth injection, the pulse fell to fifty-six, the respirations to twelve, and the temperature to ninety-six (?). The ergotin excited much nausea and sickness, due probably to the effect of the ergot on the womb, for the introduction of the finger into the os uteri increased the vomiting. The occurrence of nausea and sickness, however, is not usual.

The value of the treatment of fibroid tumours of the uterus by ergot may be considered as established in suitable cases—these are stated to be cases where the tumours are intra-mural or submucous. It is held that the tumours must be surrounded by muscular fibres capable of being excited to contraction by the ergot. The drug is supposed to interfere with the nutrition of the tumours by the contraction of the surrounding muscular fibres.

Its effects are most apparent on the womb, especially when pregnant, exciting, as it does, in the gravid uterus powerful and continuous contractions. It is used in tedious labours, when the uterus is becoming exhausted, *but must not be employed when there is obstruction to the passage of the child*, otherwise it may occasion serious damage to the delicate structures of the mother. Many hold that it endangers the life of the child also, and in two ways, namely, by subjecting the contents of the womb to powerful and continuous pressure, and by weakening the child's heart. This injurious pressure may be avoided, it is said, by administering the medicine in small doses, so as to strengthen the natural intermittent contractions of the uterus, without making them continuous. It is recommended to watch the action on the fœtal heart, and if the pulsations fall to 110, or the beats become irregular, either to discontinue the drug or to effect the delivery by instruments.

Ergot is extremely useful in post-partum hæmorrhages, arresting the bleeding by producing firm contraction of the uterus, and also by its influence on the blood vessels. It is also of great use in the various forms of menorrhagia, even when dependent on uterine tumours. It is, perhaps, the most valuable medicine known in uterine hæmorrhage, checking the bleeding when other remedies have failed, and when the patient has been reduced to an almost helpless state. In such critical circumstances it must be given in full doses. Some doctors give half an ounce of the liquid extract, and repeat the dose in half an hour, or even in a shorter time; this does not induce any toxic effects, but promptly checks, and in a few hours effectually stays the bleeding. Dry cupping over the sacrum is a useful adjuvant. Perfect rest should be enjoined.

Perroten strongly recommends ergotine injections in prolapsus of the rectum; the injections should be made deeply into the buttocks.

It is a most useful remedy in diabetes insipidus. Da Costa first employed it in this disease. The dose should be regulated by the effect, but doses large and frequent are often required.

It is said that ergot will arrest sweating.

It is stated to be useful in neuralgia and paraplegia, whooping-cough, incontinence of urine, and even in some cases of leucorrhœa; but the form of leucorrhœa is not mentioned. It is also recommended in amenorrhœa with anæmia, after the use of iron.

Ergot is said to reduce the temperature of the body, but most observers doubt the truth of this assertion. The hypodermic injection is said to reduce the temperature of cats and dogs.

The active principles of ergot are not definitely determined; there are certain nitrogenized principles, acid and alkaloidal, also according to Schmiedeberg a nitrogenized glucoside: thus we have sphacelinic acid (acid and resinoid), cornutine (alkaloid), ergotinic acid (glucoside), and further a base named trimethylamine. Not all, however, are agreed upon the names of the various components and there is accordingly much confusion. We shall therefore do best at present to remember, as Wood states, that "the watery extract (ergotine so-called) may be used as the most condensed representative of the activities of the crude drug."

HYDRASTIS CANADENSIS

Of this plant, from the order of the Ranunculaceæ, the rhizome and rootlets are official, dose, 10–30 grains, and two preparations, the liquid extract and the tincture. The rhizome contains two alkaloids, berberine and hydrastine; from the latter by oxidation another alkaloid, hydrastinine, is obtainable. Hydrastine, though in smaller percentage than berberine, is the more important alkaloid.

Under the influence of hydrastis the blood-pressure rises and the pulse rate falls; the balance of evidence favours this statement. This resultant action is probably due in part to a direct stimulation of heart, in part to a direct stimulation of the muscular coat of the arterioles (whereby the arteries are contracted).

Upon the circulation through the uterus hydrastis exerts a special influence; this is seen in its power to control uterine hæmorrhage, whether due to fibroids or other causes. Whether this local effect is the result of a predominant influence upon the uterine vessels directly, or indirectly through contraction of the surrounding muscular tissue of the womb, is not easily determinable. It appears certainly to affect the contraction of the uterus and therefore to possess ecbolic powers; it is said to be able to cause abortion or premature labour. Hydrastine causes increased peristalsis of the alimentary tract. It thus stimulates plain muscular tissue more or less generally throughout the body; according to Wood it also stimulates striped muscular tissue. In every case the primary stimulation gives way, in toxic dose, to a relaxation.

Upon the nervous system hydrastis acts by stimulating the motor centres of the cord, and from this action tetanus may result; in a later stage, from large doses, there result paralysis and loss of reflex activity.

Locally, upon the alimentary tract, hydrastis acts the part of a bitter tonic. Hydrastis comes close to ergot in its general therapeutic powers, but it possesses especial value in its tonic effects upon the alimentary tract; it is hence used in catarrhal states of all kinds in which bitters are indicated: it has been specially recommended in the catarrh of alcoholism.

It is said also to be valuable in the catarrhs of other mucous membranes, *e.g.*, in cystitis, gonorrhœa, leucorrhœa, otorrhœa, especially when locally applied. For its power to increase peristalsis it has been used in habitual constipation. For this and its influence upon the mucous membrane it may stand therefore as an excellent alimentary tonic: it is said to stimulate the secretion of bile.

The special value of hydrastis is due, however, to its power to control hæmorrhage from the uterus, hence its use in menorrhagia and metrorrhagia and in uterine fibroids. It is useful also in painful menstruation.

For local use Wood states that the preparations of hydrastis are preferable to the salts of hydrastine or hydrastinine, because we do not know "to which of the various ingredients of commercial *hydrastin* the local effects are *chiefly* due." Commercial *hydrastin* is an impure substance containing a mixture of berberine, hydrastine and resin, etc. For internal use Wood prefers the pure alkaloid or its salts.

The dose of commercial hydrastin is 2–6 grains; of the alkaloid hydrastine or its salt the hydrochlorate $\frac{1}{2}$–1 grain; of hydrastinine hydrochlorate $\frac{1}{2}$–$1\frac{1}{2}$ grains, this last may be used hypodermically in 10 per cent. solution in water. Hydrastinine is very similar in its action to hydrastine, it is regarded, however, as preferable because not at all depressant to the heart.

For local use, *e.g.*, in gonorrhœa after the acute stage has passed over, also in hæmorrhoids, in leucorrhœa, and in catarrh of the nasopharynx, a solution of one or two parts of the fluid extract in forty parts of water or mucilage may be employed (*see* Wood, also Whitla

COFFEE, TEA, ETC.

Caffeine is the active principle of coffee, tea, kola, maté, guarana, etc.; it is sometimes called theine when derived from tea, guaranine from guarana, but is one and the same principle. It is chemically allied to theobromine, the active principle of cocoa, and may be chemically expressed as methyl-theobromine.

Caffeine is now largly used on account of its action on the heart; and also for its influence on the kidney, since it acts as a direct diuretic. It is generally given in the form of the citrate, in the dose of two to five grains several times a day.

Dr. Pratt took twelve grains of caffeine; this induced restlessness, muscular tremulousness, frequent desire to pass water, mental depression, and great sleeplessness.

A man took a drachm of the citrate by mistake; there occurred burning in the throat, nausea, giddiness, faintness, numbness, tremors, free diuresis, great cardiac weakness, cold extremities, collapse; the intelligence was not affected: the man recovered (Routh).

Poisonous doses given to mammals produce restlessness, muscular weakness, tetanic and clonic convulsions, hurried breathing and death from respiratory paralysis.

Caffeine then affects both the brain and cord, the mental alterations being due to its influence on the brain, and the tetanus to its action upon the cord.

In frogs it induces rigidity by a direct action on the muscles, the motor nerves being unaffected. Pratt finds that the sensory nerves are depressed.

At first caffeine accelerates and strengthens the heart's action, but soon the contractions grow infrequent and irregular; these effects are due to the direct action of caffeine on the heart. It heightens arterial pressure. Binz and Leven find that heightened arterial tension occurs after section of the vagus.

Caffeine then, in its earlier or therapeutic stage, strengthens the cardiac contractions and heightens arterial tension, thus acting like digitalis, which in some measure it can replace. Some regard it as more efficacious than digitalis, but this has not been my experience, and certainly it possesses less power of controlling an irregularly-acting heart.

Subsequent experience has fully demonstrated the inferiority of caffeine to digitalis. It is, however, a useful adjunct to digitalis in cases of cardiac disease.

Coffee is, to some persons, slightly aperient.

The active principle of tea and coffee acts after absorption as a stimulant to the nervous system. These beverages hence are especially useful in a fatigued state of the system, and under ordinary circumstances are preferable to alcoholic drinks as stimulants.

"Coffee," says Dr. Parkes, in his work on Hygiene, "is a most important article of diet for soldiers, as not only is it invigorating, without producing subsequent collapse, but the hot infusion is almost equally serviceable against both cold and heat; in the one case the warmth of the infusion, in the other the action of the skin, being useful, while in both cases the nervous stimulation is very desirable. Dr. Hooker tells us that in the Antarctic Expedition the men all preferred coffee to spirits, and this was the case in the Schleswig-Holstein war of 1849. The experience of Algeria and India, where coffee is coming more and more into use, proves its use in hot climates." The same authority, speaking of tea, says: "Tea seems to have a very decidedly stimulative and restorative action on the nervous system, which is perhaps aided by the warmth of the infusion. No depression follows this. The pulse is a little quickened; the amount of pulmonary carbonic is, according to E. Smith, increased. The action of the skin is increased, that of the bowels lessened. The kidney excretion is little affected; perhaps the urea is a little lessened, but this is uncertain."

"As an article of diet for soldiers, tea is most useful. The hot infusion, like that of coffee, is potent against both heat and cold, is most useful in great fatigue, especially in hot climates (Ranald Martin), and also has a great purifying effect on water."

Tea and coffee are useful in the headache of nervousness and exhaustion, and as a means of rousing and keeping awake in opium poisoning.

A small cup of very strong coffee is often very useful in the paroxysm of asthma; in fact it gives relief in most cases, though it acts, it is true, very unequally.

Caffeine, in five-grain dose, as first recommended by Gubler and Leech, is largely employed as a diuretic in ascites and also in cardiac and renal dropsy.

In cardiac dropsy it is much inferior to digitalis and its allies. In renal dropsy it is very uncertain, in some cases acting abundantly, but in most cases producing little or no increase of urine. This difference in its action is difficult to explain. A similar difference in its action is noted in the case of healthy persons, in some, coffee stimulating the kidneys strongly, in others producing no effect: this individual difference may modify the action of caffeine in disease. It is supposed to act on the kidneys in two ways—viz., by increasing the amount of blood flowing through the kidneys, and by stimulating the secreting structures of the kidneys.

The influence of caffeine on the general circulation, and on the circulation through the kidney, has been ably investigated by Dr. Bradford and Dr. Phillips. The following is an account Dr. Bradford has kindly prepared for me:—

"The method of experimentation was as follows: In chloroformed and curarized animals (mainly dogs) the general blood-pressure, the volume of the kidney, and the rate of the flow of urine were simultaneously recorded on a moving surface. A solution of the particular drug experimented with was then injected into the external jugular vein, and the moment of injection was also recorded. The general blood-pressure was recorded by connecting the carotid artery with a mercurial manometer, the volume of the kidney by means of Roy's oncometer, and the flow of urine by an apparatus so constructed that each drop of urine, as it fell from a cannula placed in the ureter, made a mark on the blackened surface of the drum.

"By means of this method it was possible not only to determine the action of a drug on the circulation and secretion of the kidney, but also to see whether the seresults are due to a direct action on the kidney, or only to an indirect action resulting from the effects of the drug on the heart and vascular system generally.

"When a solution of citrate of caffeine is injected into the external jugular vein in doses of half a grain to a grain of the salt, the following changes are seen to occur:—the general blood-pressure is lowered at first, and this fall is followed by a slighter rise, but with such doses as the above both effects are small and transitory. The fall of pressure is due to a diminution in the force of the cardiac beats, and this is followed by a period during which the heart beats are slowed and markedly strengthened, to be in turn followed by a period of acceleration, of short duration however, during which the blood-pressure regains, or even slightly exceeds, its former level.

"The effects on the kidney are, however, much more marked. Immediately after the injection the kidney contracts, and this contraction may last for as long as one or two minutes, that is to say, for a much longer time than the effects produced on the general blood-pressure, which only persist for some twenty or thirty seconds. This contraction or diminution in bulk of the kidney is very considerable, and is, no doubt, due to constriction of the renal vessels. It is followed by a large expansion, that is to say, the kidney not only returns to its previous volume, but it expands considerably beyond it. This expansion of the kidney is of much longer duration than the previous contraction, and its course is also slower, that is to say, the dilatation of the renal vessels is gradual, whereas their previous constriction was quite sudden. The renal dilatation may persist for as long as twenty or even thirty minutes.

"Thus the action of caffeine on the kidney vessels is a double one, and the observed effects on the volume of the kidney are directly due to this, and not indirectly to any effect on the general blood-pressure. That this is the case is shown by the fact that smaller doses, *i.e.*, ⅛ to ¼ grain will produce marked effects on the kidney without any very obvious variations occurring in the general blood-pressure.

"The action of the drug on the heart is probably also a mixed one;

not only does it cause a diminution in the force of the beats, but it probably at the same time causes a contraction, tonic in character, of the ventricular muscle. As a result of this, the capacity of the heart is diminished, and hence a smaller quantity of blood will leave the organ at each systole, thus leading to the fall of arterial pressure.

"The effects on the flow of urine are also very marked. During the period of the contraction of the kidney the flow is either greatly diminished or even arrested. During the subsequent expansion the rate of flow is greatly increased, and this increased rate persists for as long as the renal dilatation. Many other drugs besides caffeine will produce contraction of the kidneys, but, apparently, this is the only drug that produces any actual arrest of the urinary secretion during this contraction. Ulexin, a powerful alkaloid obtained from the seeds of gorse, has a very similar action on the kidney to that of caffeine, producing at first contraction, then dilatation accompanied by free diuresis. Its diuretic action, however, is more transitory than that of caffeine, and, inasmuch as it produces violent vomiting in the human subject, it is not a drug at all suitable for diuretic purposes. There is, however, one point of interest with regard to these two drugs. If several doses of caffeine be injected into the circulation at short intervals we soon arrive at a point when each injection causes only contraction of the kidney, and diminished secretion, no diuretic effect whatever being produced by the drug. With ulexin it is different; repeated doses, or single large doses, only produce a moderate degree of expansion instead of the double effect of contraction followed by expansion. With regard to caffeine, this difference in the action when the doses are repeated too rapidly may be a point of some practical importance, since, under these circumstances, the drug ceases to be a diuretic.

"Many other substances will produce expansion of the kidney, as, for instance, urea, acetate and chloride of sodium, etc., but in no case are the results so marked as with caffeine."

Although tea and coffee are very wholesome beverages, yet either the one or the other, or both, will in some persons occasion palpitation of the heart, sleeplessness, and mental excitement. Both tea and coffee, but especially tea, are frequent causes of dyspepsia, in particular, flatulent dyspepsia.

Some maintain that caffeine is as useful a local anæsthetic as cocaine, thus it is stated that two minims of a 2·5 per cent. solution completely removed sensibility (Terrier). Dr. Faurel employed a 2 per cent. solution of caffeine almost to the exclusion of cocaine in affections of the pharynx and larynx. These statements, however, do not agree with the experience of others, thus Dr. Laborde could not obtain anæsthesia of the cornea even with concentrated solutions. This observer found that a glucoside obtained from Boldo produced anæsthesia quite as marked as that obtained from cocaine.

Caffeine, in the form of the effervescing citrate of caffeine or of the hydrobromate, is useful in sick headache (migraine), but salicylate of soda, antipyrine, antifebrine, phenacetine, are, all of them, much more effectual.

The following solution is useful for hypodermic use:—Twenty grains of caffeine, seventeen grains and a half of salicylate of soda, and a fluid drachm of water. Three minims of this solution contain one grain of caffeine. It is often more convenient to make the solution of the strength of 1 grain in 4 minims, as the 1 in 3 strength tends to solidify. This salicylate of caffeine is a most powerful cardiac stimulant, and, injected beneath the skin in 2-grain dose (6 or 8 minims of the above solutions) every 4 or even every 3 hours, it will often tide the heart through a crisis, as for instance in pneumonia. It seems of special value in pneumonia, and in some of the worst cases of this disease, occurring in alcoholics, it has seemed to be the means of saving the patient. Larger doses than those above mentioned are sometimes given, viz., up to 30 or even 45 grains in 24 hours.

Theobromine acts very much like the preceding, but it is more powerful as a diuretic than caffeine, and its effects last longer. It is a weak base, comparatively insoluble in water—its taste is bitter. Binz gives the dose as double that of caffeine. The sodio-salicylate compound of theobromine is also known under the name of "diuretin." It is given in doses of 15 grains, repeated 5 or 6 times in the 24 hours; it may take a few days for the drug to produce its full effect. This salt is very soluble in water.

Theobromine has less tendency than caffeine to tetanize and to produce spasm of the kidney vessels, and inasmuch as this latter action appears to be the reason for the irregular diuretic action of caffeine, therefore theobromine has the advantage as a diuretic.

Theobromine does not cause sleeplessness.

COCAINE

[*By Dr. Dudley W. Buxton.*][1]

COCAINE produces a localized anæsthesia when applied to the mucous membranes or skin; its action is extended more deeply when a hypodermic injection is made into the subcutaneous tissues. Paul Bert asserts that the action of cocaine is purely local, extending only so far as the drug actually comes in contact with the tissues. However, this does not correspond with the experience of others. It has been thought, although as yet no sufficient proof has been advanced, that cocaine acts by paralyzing the terminal twigs of the sensory nerves, as well as sensory end organs. On the other hand, many careful

[1] The additions to this article, between brackets, are made by me, S. R.

observers have come to the conclusion that the anæsthesia caused by cocaine is due to vaso-motor action. The cocainized area becomes pale, blanched, and finally almost bloodless, so that the sensory nerves, being deprived of their due blood supply, cease to communicate painful impressions received from without. It is found that there is firstly a loss of sensibility to pain, next to variations in temperature, and finally tactile sense is abolished.

And further, the nerves of special sense cease to convey their peculiar impressions. In every case the effect produced is transitory, and passes off in from twenty minutes to half an hour.

When painted over the skin a sensation of warmth is at first experienced, to be succeeded in a few minutes by complete loss of sensation, the part becoming anæmic.

The depth to which the action of cocaine penetrates seems to differ considerably, but in no case does the anæsthesia appear to extend beyond the structures proper to the skin or mucous membrane.

Coca has long been known to exert very decided influence over the central nervous system. Many South American tribes use it to habituate themselves to feats of endurance, needing, it is said, little food or rest while under its influence. Von Tschudi, the Swiss naturalist, found that the use of the infusion of the leaves enabled him to scale the higher Andes without suffering from the hæmorrhages incident to altitudes. Aschenbrandt administered $\frac{1}{7}$ gr. of hydrochlorate of cocaine to Bavarian soldiers without their knowledge, and found it removed their sense of fatigue, while it enabled them to undergo fresh hardships and to subsist on a minimal diet. He found no ill-effects followed. However, Moreno and Maiz state that coca habitués suffer from impaired digestion, intractable constipation, emaciation, muscular tremors, and die of marasmus.

Upon the central nervous system cocaine acts as an excitant. Tumas of St. Petersburg found that painting over the exposed motor areas of the brain lessened their excitability without any initial increase. Epileptiform convulsions were with great difficulty elicited even with a very strong faradic current. In the lower animals, the first effect of cocaine is to produce a curious calm, to which succeeds a period of great excitement. Weakness, marked by muscular tremors, then appears, and the tremors later on pass into convulsive movements, while the weakness gives place to paralysis. The head rolls from side to side like a pendulum, a phenomenon which Von Anrep attributes to some alteration caused by cocaine in the tension of the fluids of the semicircular canals. Epileptiform convulsions are developed subsequently, and finally tetanic (spinal) rigidity supervenes, and the animal dies asphyxiated.

The reflexes are increased, and this takes place both before and after section of the spinal cord. In dogs large doses cause great excitement, with expression of joyousness and delight; but if the dose be pushed, the animals become dejected and struck with terror, their limbs tremble, and they become seized with convulsions. In some animals opisthotonic convulsions occurred, and in some spastic rigidity, In man only the excitement stage with exhilaration has been attained, and it is probable that the toxic dose of cocaine is for man very large. Hammond, of New York, after taking very large doses, suffered tachycardia with irregular heart's action, dyspnœa, loss of mental control going on to unconsciousness. In his case no spinal or medullary effects were produced, but as neither anæsthesia nor hyperæsthesia appeared it seems probable the dose taken was below his physiological limit. [A large dose first stimulates, and then paralyses the sensory and motor nerves, the sensory being more affected than the motor. The spinal cord, Ott finds, is similarly affected.] As much as twenty grains have been taken without any harmful result. It kills by causing cessation of respiration. The lethal dose for the lower animals appears to be 0·03 grammes per kilo of body weight; for man no fixed dose can be given, as quite small quantities will affect some persons very profoundly, while very large ones are borne with impunity by others. The capriciousness of the drug in this respect is so great that its use requires the greatest caution in cases in which its action has not been tested.

Upon the circulation cocaine acts in two ways: it constricts the vessels, and so increases arterial pressure, and it produces slight exciting action upon the heart, which, however, is soon followed by a marked weakening and irregularity of that organ.

[The contraction of the blood-vessels induced by either topical or general administration is followed by dilatation, and if a large quantity is used, dilatation at once ensues of the arteries, capillaries, and veins. This primary dilatation lasts about six minutes, and is followed by contraction for about the same space of time. Weak doses, hypodermically administered, contract the vessels for a short time, dilatation beginning in about ten minutes, and continuing for three-quarters of an hour (Krüger). The contraction of the vessels is ascribed to stimulation of the vaso-motor centre, as section of the spinal cord prevents a rise of blood-pressure. Small doses accelerate the pulse, large doses slow it. A full dose, as of half to three-quarters of a grain, given hypodermically, accelerates the pulse to 120, or 130, or 140 beats per minute, and makes it irregular.]

Cocaine exerts a modifying effect upon the secretions. It lessens the production of saliva, gastric juice, tears, and, it is said, also of perspiration.

The peristaltic movements of the intestines are at first increased, but at length become sluggish, and then paralysis occurs. This explains the fact that several authorities speak of cocaine as acting mildly upon the bowels, while, as was stated above, those who abuse it by excess suffer from constipation and dyspepsia.

The action of cocaine upon the muscular system is at present uncertain, for while Nikolsky and Von Anrep expressly state the muscles are unaffected, Ott and Buchheim and Eisenmenger describe its behaviour as presenting a parallel to that of veratrine.

The quantity of urine is lessened when cocaine is taken, as is the amount of urea excreted, and this, coupled with its general behaviour in supporting the body under fatigue and low diet, would suggest that it possesses the power of staying tissue change throughout the body.

A slight rise in the general temperature occurs under cocaine administration; large doses are said to raise the rectal temperature considerably, but as a rule this is preceded by an initial depression. In poisoning by cocaine the rectal temperature becomes subnormal before death.

Elimination of the drug takes place probably by the kidneys, and it is often accompanied by the production of albumen and sugar in the urine. Von Anrep regards these as resulting from the asphyxia caused by the cocaine's paralyzing action on the respiratory muscles, and not from any direct action of the alkaloid.

All observers appear to agree that the intellect remains unaffected, save by way of exhilaration or depression.

Upon the pupil cocaine possesses a marked mydriatic effect. This begins to show itself in from ten to twenty minutes after dropping the solution upon the conjunctiva, and it reaches a maximum in half an hour, persisting for another half hour. According to Dr. Knapp, of New York, cocaine dilates the pupil as much as atropin, but its effects pass off more rapidly; and further, it reduces the power of accommodation, while it does not wholly do away with it. Even before the dilatation has ceased the power of accommodation returns in full force. It seems that the range of accommodation is shortened by moving the near point from the eye, but the far point is not appreciably affected.

The value of hydrochlorate of cocaine as an anæsthetic in ophthalmic practice has now become fully established. A four per cent. solution is instilled into the conjunctiva, three or four times, at intervals of five minutes. When the conjunctiva can be picked up without the patient's experiencing any discomfort the operation may be proceeded with. In this way iridectomies, extractions and operative measures dealing with the conjunctiva, are rendered in most cases painless. Dr. Keyser has met with several cases of panophthalmitis which ensued upon operations performed upon cocainized eyes, and he attributes this unhappy result to the cocaine. It is alleged that cocaine solutions rapidly decompose and the presence of micro-organisms in such solutions set up panophthalmitis and other troubles. A further evil consequence, alleged to have followed the use of the hydrochlorate as a mydriatic, is the supervention of yellow opacity of cornea. This discoloration was speedily got rid of when atropin was used in place of cocaine.

In operations for squint it is not sufficient simply to instil the cocaine. A few drops of a four per cent. solution are injected by a fine hypodermic syringe through the cocainized conjunctiva into the muscle which it is desired to tenotomize. Mr. Walter Jessop adopted a similar plan to produce anæsthesia of the canaliculi. The same surgeon cautions against cocaine in cases in which it is requisite to remove foreign bodies from the cornea, as it renders that structure so flaccid that operative measures become very difficult, and unless great care is taken serious abrasion of the corneal surface may be caused.

In the treatment of glaucoma by section of the iris cocaine fails, unless it is injected into the anterior chamber. Mr. Jessop has used with success a small steel bent cutting needle, the stem being bored and made to fit a hypodermic syringe. Excision of the eye in most cases in which cocaine was used proved painful, at all events during the last stages, when the deep structures were divided. It is well in preparing for these operations to inject hypodermically both the subconjunctival and subfacial tissues. The photophobia ensuing upon corneal ulcers or other causes is relieved completely by instillations of a four per cent. solution of the hydrochlorate of cocaine. When it is desired to obtain an anæsthetic without a mydriatic effect it is necessary to combine pilocarpine with the cocaine. Ten drops of a five per cent. solution of pilocarpine to a drachm of a four per cent. solution of hydrochlorate of cocaine answers admirably.

A convenient method of using cocaine in ophthalmic practice is in the form of the officinal discs which are composed of gelatine, glycerine, and $\frac{1}{200}$ gr. of hydrochlorate of cocaine. Placed beneath the eyelid while the lids are closed, it soon exerts its influence. In prolonged operations about the eye it is necessary to repeat the dose of cocaine at intervals, and this is easily done by using a drop bottle.

A peculiarity in the effect produced by cocaine, and pointed out by Kœnigstein of Vienna, is that a certain amount of exophthalmos follows its topical application to the eye; but this soon passes off, and leaves no untoward consequences. The fundus oculi and the intraocular tension are stated by most observers to remain unaffected, but Turnbull, of Philadelphia, asserts that the latter is increased by cocaine. In simple catarrhal conjunctivitis weak solutions give great relief. Mr. Leahy, quoted by Dr. Turnbull, used successfully sulphate of atropine $\frac{1}{2}$ %, sulphate of cocaine 2%, in vaseline for gonorrhœal ophthalmia. Another useful method of applying this anæsthetic is to combine it with vaseline, making a five per cent. ointment, and smearing it over the part to be rendered insensitive.

[A three per cent. solution may cause exfoliation of the corneal epithelium or chronic interstitial keratitis and panophthalmitis.]

In examinations and operations about the larynx cocaine is valuable.

Dr. Semon recommends painting the larynx, uvula, and neighbouring parts with a twenty per cent. solution. This not only enables the surgeon to obtain a good view of the parts, but allows the painless removal of polypi and other growths. The operation can be performed in five or ten minutes after this application. Great care must however be taken that the solution is not applied too freely, as syncope and dangerous collapse have in some instances followed this practice.

For ulcerations on the epiglottis, whether tubercular or otherwise, and in acute or chronic laryngitis a similar application is of value. Dr. Neale states that snipping off the uvula can be accomplished painlessly, if the part be painted once or twice with a two per cent. solution.

Tonsillitis is relieved by the use of a four per cent. solution of the hydrochlorate painted over the tonsils; the dysphagia disappears, and pain is assuaged. It is necessary to repeat the application every hour or so, according as the pain returns or not. In other forms of dysphagia cocaine painted over the pharyngeal mucous membrane is very serviceable. A 2 per cent. solution painted over the fauces facilitates the introduction of the tube of the stomach pump or œsophageal bougies. The tube may also be smeared with a cocaine-vaseline (2 per cent.).

De Havilland Hall cautions against its use in the form of a spray from the frequency with which toxic symptoms arise.

According to Dr. Bosworth and others, painting the nasal mucous membrane with a twenty per cent. solution, greatly relieves hay fever, and removes its paroxysms. A pledget of cotton wool soaked in 5 per cent. cocaine solution is very useful in all catarrhal affections of the nose and frontal sinuses, but the relief is not as a rule permanent, and the stage of recovery seems to be prolonged especially in coryza. De Havilland Hall states that the admixture of resorcin, 10 per cent. to 20 per cent. of cocaine, lessens the danger of toxic effects.

When strong solutions are used there is considerable danger of toxemia.

When cocaine is painted over the mucous membrane lining the meatuses of the nose it causes a marked constriction of the parts, so that the mucous membrane clings closely to the bony framework. This peculiarity is of great service in anterior and posterior rhinoscopy. Mr. Cresswell Baber recommends the use of cocaine when there is undue erection of the turbinate bones, and also for hæmorrhage from the nasal mucous membrane. Operative measures which involve the deeper nasal structures, as a rule, require a general anæsthetic.

[Cocaine hydrochlorate is useful in psoriasis of the tongue; thus a tabloid sucked just before a meal averts the pain from the passage of the food.]

According to Dr. Henry Reden, an atomizer containing a four per cent. solution of the hydrochlorate is a sure means of curing otalgia.

He directs the patient to inhale vigorously, then by closing the lips and expanding the cheeks to force the spray up the Eustachian tubes. This plan he supplements by spraying the tympanic membrane through the external meatus. The inhalation was repeated every three minutes. Perhaps a better plan is to pass a Eustachian catheter and inject a few drops of a two per cent. solution, taking care to warm it beforehand.

Dr. Weld, of New York, paints the gums with a ten per cent. solution before removing tartar from the teeth, and in dealing with a sensitive tooth pulp Merck's method of working up a little of the hydrochlorate, or, better, the citrate, into a mass, and pressing it into the painful cavity, is highly satisfactory. It may also be applied by small cotton-wool plugs soaked in a twenty per cent. solution. Fissures, ulcers, and painful swellings on the tongue, lips, and mucous membrane of the cheeks cease to give trouble after painting with cocaine. As it does not cure the condition, the pain will return unless frequent paintings be had resort to.

The injection of a few drops of a two per cent. solution into the urethra relieves the pain and smarting of acute gonorrhœa. The solution, which must not be made with alcohol, should be retained for a few minutes and repeated before micturition is attempted. It is said to shorten the duration of the urethritis. A similar manœuvre may be tried before catheterization, in cases in which instruments are badly borne. When a stricture is present, it is often difficult to render the urethra insensitive beyond it. An injection of four per cent. is highly spoken of in irritable bladder. The gravest symptoms have followed the injection of weak solutions into the bladder, and Berger reports a fatality following the use of one drachm of a 1½ per cent. injected into the tunica vaginalis. Small cotton wool tampons soaked with a two per cent. solution relieve the burning pain of blenorrhœa. In some cases a five per cent. ointment proves more serviceable. The intense suffering caused by the itching of scrotal eczema yields at once to a lotion of cocaine. Pruritus ani and of the pudendum and vaginismus are also relieved, although of course it is necessary to ascertain and remove the cause of these painful conditions.

Dr. Symes, who recommends suppositories and pessaries for the relief of painful conditions about the rectum and vagina, cautions that the former should not exceed five grains, the latter not fifteen grains, as dilution of cocaine considerably lessens its activity. The doses are, however, very large and not free from danger.

In surgery, cocaine is used largely, but the hypodermic injection of even small quantities has proved unreliable and often dangerous. Schleich, of Berlin, has introduced a method by which he renders the tissues to be cut œdematous, by repeated endermic, followed by hypodermic, injections of sterilised water containing cocaine hydrochlorate 1 in 1,000 or even 1 in 10,000. Réclus, who has followed a somewhat similar procedure, speaks well of it. To ensure success Schleich's directions have to be followed out most rigidly.

Manteuffel found hypodermic injections of cocaine efficacious in checking recurrence of hæmorrhage in a hæmophile.

Dr. Adelberg Weiss, of Vienna, was able to allay the agonizing pain of extensive scalding by painting the skin with cocaine lotion.

As a hypodermic injection the hydrochlorate of cocaine proves useful in the treatment of various forms of neuralgia.

[It is better to begin with less than gr. ⅛ and to inject in the course of the nerve, as the susceptibility to the drug varies in different persons. I have seen the hypodermic injection afford great relief for several hours in cases of severe neuralgia. It is especially useful for patients who are disagreeably affected by hypodermic injections of morphine; often the patients experience a very pleasant stimulation, which they compare to the effects of champagne, and so exhilarating is the result sometimes that they are very reluctant to discontinue the drug.]

Merck has prepared an artificial cocaine from benzoyl-ecgonin.

The salts of cocaine have been employed internally for their action upon the heart and nervous system. Thus Dr. Hicks, of New York, found doses of cocaine relieved the dyspnœa due to weakened respiratory action. He also found benefit followed its use in cases of palpitation when a heart weakened, although free from valvular lesions, had become dilated and atonic. One half a grain alleviates these symptoms, and proves serviceable in nervous exhaustion and sick headache. In the treatment of alcohol craving and the morphine habit, many careful observers pronounce cocaine to be of great benefit. It restores the appetite, induces sleep, and promotes digestion, while it soothes the brain and induces a feeling of contentment and calm. On the other hand many cases are reported of persons who have relinquished the morphine habit, only to become addicted to cocaine.

Luton's method of giving cocaine in Variola is spoken well of by Pepper. He gives 4 to 5 drops of a four per cent. solution every six hours by the mouth to a child aged five, increasing the dose by one drop for each year of age. It is best not to use it hypodermically, but if this is inevitable, one quarter of the above dose should then be used. Samayoa has followed this procedure and found it arrested the development of the disease if given early, in any case it diminished the severity of the attack, and lessened or prevented suppuration by aborting the pustules.

Given in the form of a pill, cocaine sometimes eases painful affections of the stomach, and averts vomiting. It is sometimes useful in the vomiting of pregnancy, and may be taken by the mouth, administered hypodermically, or applied to the os uteri. Small doses relieve the insatiable hunger (Boulimie) occasionally present in pregnancy.

An electrical current assists the absorption of cocaine, like other alkaloids. The positive pole should be dipped in a solution of hydrochlorate and applied to the skin, which speedily becomes anæsthetic.

Administered as an anal injection or suppository, it checks the diarrhœa and straining of dysentery. In suppositories it relieves pruritus ani. In using cocaine to allay the itching of eczema and other skin affections, it is often necessary to get rid of the horny layers of epidermis, before applying the drug.

Taken in $\frac{1}{16}$-grain doses three times in 24 hours, the hydrochlorate of cocaine benefits infants of 8 months suffering from whooping-cough. Carré and Wells give it in water and find it lessens the cough, increases sleep, and lessens the severity of the disease.

The addition of $\frac{1}{600}$ of a grain of salicylic acid preserves the cocaine, but renders its solution rather irritating, and so should not be used in ophthalmic practice. Cocaine hydrochlorate also decomposes if subjected to high temperature.

Dr. Spriman claims that benefit follows a quarter of a grain in nervous dyspepsia, given three or four times a day in milk or coffee.

It is sometimes effectual in checking sea-sickness, and the retching following inhalation of ether and chloroform.

Mosler, of Greifswald, and Beschorner have used a two per cent. solution hypodermically in asthma with relief.

Eucaine has now been used extensively in ophthalmic practice. It neither paralyses accommodation nor induces mydriasis. It does not decompose on boiling, and hence can be sterilized; it also remains unchanged for a prolonged period. It is said by Kiesel not to depress the heart and to be less toxic than cocaine. According to Vinci its action, although similar to, is less harmful than, cocaine. All authorities are not in accord as to the sufficiency of the anæsthesia induced by eucaine. A two per cent. solution is used for instillation in ophthalmic surgery, and anæsthesia results in two or three minutes.

CINCHONA AND ITS ALKALOIDS

Salts of quinine are protoplasmic poisons, arresting amœboid, and allied movements of the white corpuscles. Even weak solutions are highly poisonous to protozoa and infusoria (Binz), more so even than salts of strychnine or morphine. Small quantities of quinine salts destroy septic germs and arrest putrefaction more thoroughly than most antiseptics, including even arsenic and creasote. Quinine is not equally destructive to all micro-organisms; those of septic fluids resist its action to a great extent. With the exception of strychnine, quinine hinders alcoholic and butyric fermentations in greater degree than other bitters, but it does not prevent the action of ptyalin on starch, no [illegible] on of amygdalin into oil of bitter almonds, prussic acid and glucose. Cinchonine possesses similar properties, but in a weaker degree than quinine.

Powdered cinchona contains, besides various alkaloids, a considerable quantity of tannin, a fact to be borne in mind when we administer bark, or any of its preparations.

Finely powdered bark dusted thickly over foul, indolent, sloughing, and even gangrenous ulcers, and left to form a kind of poultice, does apparently promote the healing process. Hospital gangrene has been successfully treated in this way.

Bark has been employed as a dusting powder to check the profuse formation of pus, mucus, or the secretion of eczema.

Quinine in the form of spray, and as a strong solution, may be applied topically to the throat in diphtheria.

Since its adoption by Helmholtz solutions of quinine have been employed to flush the nose in hay fever. In some cases this treatment succeeds, but in most instances it fails completely.

Dr. Currie has stated that he can always arrest excessive sweating by bathing the skin with a solution of alcohol (a pint) and quinine (a drachm).

Cinchona bark and its preparations are bitter to the taste, and, like all bitter substances, stimulate temporarily the salivary glands. The tannin of the bark precipitates the mucus of the mouth, and acts likewise as an astringent to the mucous membrane itself.

The alkaloids, when swallowed in an insoluble form, combine with the acids of the gastric juice and become soluble, so that, as a mere solvent, it is unnecessary to administer quinine and cinchonine with acids, and a large dose merely suspended in fluid is far less bitter than when dissolved.

The taste of quinine can be concealed by adding to it an equal quantity of powdered ginger. Milk, also, covers the taste of quinine. When large doses, such as forty grains, are administered, it is better to give the drug in pill, otherwise it may cause sickness.

The alkaloids of bark, probably, undergo no other change in the stomach than that just mentioned. Their action upon the digestive tract is similar to that of bitters generally, being slightly irritant to the mucous membrane; in this way they produce, both in the mouth and stomach, an increase of mucus. It is generally stated that, for a short time and to a small extent, cinchona increases the amount of the gastric juice; experiments show, however, that cinchona and its alkaloids check the action of the gastric juice on the food, and check also some fermentations, such as that of sugar by yeast. As to which of these actions predominates, the favouring or the hindering, it is difficult to determine, experimentally; but clinically, experience seems clear that even when the stomach appears to be healthy, quinine certainly sharpens the appetite and assists digestion, especially in states of general debility.

These substances are useful to check unhealthy or excessive fermentations in the digestive canal, but if too long employed they disorder the stomach, producing heat and weight at the epigastrium, loss of appetite, nausea, sickness, and even diarrhœa. Poisonous doses excite great thirst, burning pain at the epigastrium, and vomiting.

Quinine appears to exert no influence on the secretion of bile.

When quinine is taken in large quantities some of it is said to pass off with the fæces.

It has been given internally with benefit in cases of worms, but inasmuch as the decoction of cinchona appears to have no direct influence on ascarides and on teniæ, the good effects of the drug must be due to its beneficial effect on the mucous membrane, whereby the production of the abundant mucus which favours the development and growth of these worms is prevented.

Quinine passes readily into the blood; and since it can be detected unchanged in the urine, sweat and secretions of healthy persons and of fever patients, it is probable that very little undergoes decomposition in the body. It is eliminated almost exclusively by the urine, the greater part of it being excreted in six hours.

Quinine lessens the power of hæmoglobin to convert oxygen into ozone, and so lessens the ozonizing action of the blood. (Binz and Schulte.)

Large doses affect the sight and hearing, causing subjective noises, as of bells ringing in the ears, and occasionally producing deafness. Sometimes, but very rarely, a large dose destroys the sense of hearing for life, but usually, within a short time, possibly a few days, the noises cease, and the hearing again becomes natural. Large doses often dim the sight and sometimes cause total blindness, this however is temporary; rarely, it may be permanent. I have noticed on some occasions that the defect of vision is strangely limited to one eye, or begins first in one eye. The pupil of the affected eye is very generally dilated, and sometimes to an extreme extent. Severe frontal headache, with dull, heavy, tensive, and sometimes agonizing pains, are some of the most distressing and frequent symptoms that follow a large dose of quinine. While these symptoms last, and, indeed, generally before they appear, the face is flushed, the eyes suffused, and the expression is dull and stupid. Even small doses, in persons very susceptible to the action of this medicine, will produce some of the foregoing symptoms, especially the headache.

Workers in bark suffer sometimes from a scaly papular eruption, or from a vesicular weeping eruption; occasionally there may be great swelling of the genitals, or of the face and eyelids, with redness of the eyes. Sometimes there is complaint of great itching of the whole body, and it is known that quinine sometimes produces urticaria.

In one of my patients a small dose of quinine always brought out a uniform red rash over the whole body, most marked on the back of the neck. This was accompanied by a very severe stinging pain, especially in the nape of the neck and in the clefts between the fingers. Desquamation, as free as after a sharp attack of scarlet fever, always followed the rash.

In some people quinine produces large patches of erythema, with great irritation, gastric disturbance, and accelerated pulse. A patient tells me that even small doses always excite violent urticaria, her face swelling till she can scarcely see. She is so intolerant of this drug that a quinine hair-wash brought out a crop of urticaria on the head, and a tooth-powder, containing a small quantity of quinine, caused swelling of the lips and gums.

Many of the foregoing head symptoms are due no doubt to the action of quinine on the brain. In toxic doses it excites convulsions. Chirone and Curci find that the removal of the motor centres of the brain prevent these convulsions, and if the cerebral hemisphere is removed on one side the convulsions are unilateral. Albertoni, on the other hand, finds that quinine will induce convulsions when the cerebral hemisphere or the cortical motor centres are removed; he raises some serious objections to Chirone and Curci's experimentation.

Experimentally it has been shown that some of the peripheral organs of special sense are very appreciably affected by quinine, thus the internal ear and the middle ear may suffer from more or less pronounced congestion, and inflammatory changes may affect the vessels of the disc, and optic atrophy may ensue.

Small doses increase the reflex action of the spinal cord; larger doses lessen reflex action by stimulating Setschenow's centre; still larger doses destroy the reflex function.

In large doses quinine depresses the heart by its direct action, and probably also the vaso-motor centre; hence there is diminished arterial tension.

I find that, like other antipyretics, quinine, when given in toxic doses, does not reduce a non-febrile temperature, and Dr. Bartholow has confirmed my experiments.

Kerner finds that quinine prevents the rise of temperature from active physical exercise, and that this is not due to increased loss of heat through the skin by perspiration, because quinine lessens perspiration.

Drs. Wood and Reichert, however, show that cinchona alkaloids increase both heat formation and heat dissipation, heat dissipation being much in excess of heat formation. They do not feel justified in deciding which is primary, *i.e.*, whether increased loss of heat induces increased heat production or *vice versâ*.

Drs. Cutler and Bradford find that quinine diminishes the red, and increases relatively the number of white, corpuscles in the blood.

Piorry maintains that during a fit of ague quinine at once diminishes the size of the spleen, and it is said also that this drug exerts a similar effect on this organ during other fevers, and even in health. Jerusalimsky finds that quinine will reduce the size of the spleen, even when the nerves going to the spleen are divided before administering the drug.

The influence of cinchona and its alkaloids on the various forms of intermittent fever is well known, and that it controls this formerly common complaint more effectively than any known drug. It has been supposed to check the fever by its influence on the spleen, but, granting this assumption, it yet remains to show how the influence of the quinine on the spleen prevents the return of the fever paroxysms. It probably kills, or renders inert, the microbe on which this disease depends. Golgi, Marchiafava, Celli, Osler, Councilman, and others have investigated the action of quinine or the parasite or amœba of malaria, and the following has been formulated: "Quinine acts on the amœba of malaria in those phases of its life which are occupied in nutrition and development; when, however, the transformation of hæmoglobin into black pigment is arrested, and in consequence the nutritive activity ceases, and the reproductive phase begins, then against this latter process quinine is of no avail." (*The Parasites of Malarial Fevers*, Marchiafava and Bignami.)

Quinine generally arrests the disease at once. It is well, however, to bear in mind that this remedy may dissociate the other symptoms from the elevation of the temperature, or, in other words, it may remove the shivering, sweating, and quick pulse, while the temperature may remain as great, or nearly as great, as on previous days. Mere rest will occasionally effect the same dissociation. Unless the unnatural elevation of temperature has been restrained the paroxysms will speedily return. This fact it is necessary to recollect, otherwise it may be concluded that with the removal of the more obvious symptoms the disease itself is cured, and thus the patient may be permitted to return to his usual avocations.

A still more curious circumstance remains: viz., that quinine may check all the symptoms, even the periodical elevation of the temperature, and yet about the same time of day that the series of symptoms were wont to take place, an increase in the urea and urinary water may occur, just as during a severe paroxysm; that is, all the symptoms of the paroxysm may be absent, except those pertaining to the urine.

I made two experiments which tend to show that quinine, given after the commencement of the fit, is powerless to prevent the elevation of temperature of that attack, although the drug may effectually prevent the rise in succeeding paroxysms. It is said that quinine subcutaneously employed after the paroxysm has begun will arrest the fit.

Some hold that quinine is less [illegible] ed bark,
even when the cinchonine is a [illegible] held
that powdered bark is mor [illegible]
hand, there is no doubt that [illegible]

and of the tannin which it contains, does frequently upset the stomach.

There is great variation of practice regarding the administration of quinine, some giving small doses several times daily, others preferring a single large dose daily; both methods are useful, but under different circumstances. In the mild forms of ague, such as those now met with in this country, small doses several times daily are sufficient; but in the malignant forms large doses, even several times a day, may be required to summarily arrest the disease. Some say that the drug should be given at the very commencement of the fit, but this practice is held to be bad, and to make the immediate attack more severe.

Trousseau advised that fifteen grains should be taken immediately after the fit, and repeated with an interval, first of one, then of two, three, and four days, and so on. Probably this is a good means to extirpate the latent tendency to the disease and to ensure a perfect cure, for it must be recollected that, judging by the temperature, a patient may unconsciously undergo even a severe fit, a fact proving the great importance of employing the thermometer. Trousseau's plan is judicious, moreover, because even when the quinine has removed all symptoms the patient is liable to a recurrence of the attack, from various causes, such as depression of the health, or a sudden shock, *e.g.*, from an accident or operation; indeed, in many instances, this tendency to ague lasts for years.

It is important to recollect that the effect of quinine on the fit bears no relation to its physiological operation, either in time or degree, for a small dose may prevent the occurrence of a fit otherwise due twenty-four hours afterwards, though the effects of the dose on the system have never become apparent, or have long ere this passed quite away.

Quinine is of especial use in the malignant forms of ague. The dose should be large, and given in a non-febrile period. In these severe forms of the disease no circumstances are to be considered as contra-indicating its use. If it cannot be borne by the stomach it may be given by the rectum, or hypodermically. For rectal injection it is recommended to dissolve the quinine in ether, as this solution is less irritating than an acid, alcoholic, or chloroformic solvent. Salts of quinidine, on account of their solubility, have been recommended for hypodermic use, but the quinidine of commerce is generally very impure. Dr. Ranking, and others, find the hypodermic method highly successful. Dr. Ranking has treated 200 cases in this way. He uses a warm solution of the bi-sulphate, 1 in 10, injecting five minims. On an average three injections cure, the fever being arrested on an average in 2·5 days.

In remittent malarial fever large and often repeated doses should be administered during the remission.

The more recent the attack the sooner and more certainly will quinine cure.

It is less efficacious in quartan than in other forms of ague, probably because old ague generally assumes the quartan type. In obstinate cases, resisting quinine, arsenic often succeeds.

In some cases where quinine appears powerless the administration of an emetic each morning will sometimes bring the disease at once under the control of the drug.

Quinine is used as a preventive of ague, and in the navy it is a very useful sanitary precaution, when this fever prevails, to give quinine to the sailors sent ashore, both before and after landing. This preventive effect is forcibly illustrated by some observations recorded by Dr. J. B. Hamilton, of the Royal Artillery, who treated his men with quinine, with the result that but few succumbed to ague, and those who were attacked suffered mildly, whilst, on the other hand, another doctor, disbelieving in the preventive action of the drug, allowed his men to go unprotected by quinine; of these a large number were struck down with fever, and several died. Dr. Hamilton believes that cinchona is superior to quinine as a prophylactic, and quinidine very inferior to quinine.

The other alkaloids of bark, although inferior to quinine, will check ague.

The Medical Committee appointed by the Indian Government to estimate the relative value of the alkaloids quinine, cinchonine, quinidine, and cinchonidine, decided in favour of the use of all of them in ague. Naturally, there were individual differences of opinion concerning their exact relative value, but all agreed that they were each and all efficacious against ague. The general opinion was that sulphate of quinine and sulphate of quinidine possess equal febrifuge power; that sulphate of cinchonidine is only slightly less efficacious; and that sulphate of cinchonine, though considerably inferior to the other constituents, is yet a valuable agent in fever.

It is a fact well known that in the case of persons who have encountered ague, even many years beforehand, other diseases are prone to take on an intermittent type, and that in such instances quinine is often of great service.

Again, certain forms of neuralgia depend not uncommonly on malarial poison, and are then apt to assume a type distinctly periodic. Here quinine in large doses, given shortly before the expected attack, is highly serviceable. Quinine often proves useful, also, in non-malarial forms of neuralgia presenting a periodic character. Even when the element of periodicity is quite absent large doses of quinine often succeed in removing the pain of this distressing malady. Quinine is said to control neuralgia and ordinary faceache more effectively when the powder is taken in minute quantities every few minutes—for instance, as much as will adhere to the finger-tip dipped into the powder.

It has long been recognised that quinine has most influence on neuralgia of the supra-orbital branch of the fifth—a branch most often affected in malarial neuralgia, and non-malarial periodic neuralgia; but even non-periodic neuralgia of this branch is probably more amenable to quinine than neuralgia of the other branches of the fifth, or of other nerves.

Quinine is recommended in other febrile diseases, such as typhoid fever, bronchitis, broncho-pneumonia, pneumonia, and acute phthisis. Numerous observations prove that large doses effect a temporary reduction of temperature, occasionally a considerable fall.

In Germany, the quinine treatment, originally introduced by Vogel, was largely adopted in all fevers, especially in typhoid fever. Liebermeister, who followed him, gave large doses of 20 to 45 grains at nightfall, so as to increase the morning fall down to the normal, or nearly normal, temperature. If the dose was inadequate to effect this he increased it. He strongly insisted on the necessity of giving the quinine in one large dose, rather than in several divided doses, as the piecemeal method has far less effect on the temperature. After very considerable experience, he averred that he had never seen these large doses produce any injurious effects, the decline in the temperature usually beginning a few hours after taking the medicine, and the minimum temperature being reached in from six to twelve hours.

The combination of the cold bath with quinine is strongly recommended by some observers, inasmuch as the quinine reduces the number of baths necessary to keep down the fever.

Quinine is supposed to control inflammation by its influence on the movements of the white corpuscles, and Binz maintains that, after artificially irritating and inflaming the mesentery, the administration of quinine inhibits or kills the white corpuscles, preventing their migration into the tissues.

The drug is supposed by some to lower temperature by lessening the ozonizing power of the blood, and thus checking oxidation.

Quinine in large doses of from ten to thirty grains, repeated several times a day, has been recommended in rheumatism. Some advocate its use at the commencement, others at the termination of the attack—at the commencement, with the view of shortening the course of the attack, and diminishing the chance of relapsing, and at the termination, with the hope of preventing the profound anæmia which so generally accompanies acute rheumatism. Other authorities are altogether averse to the use of this drug, maintaining that it favours relapses, and merely disguises the pain, and that it in no degree shortens the attack. Quinine is incomparably inferior to salicylate of soda.

My experience is completely at variance with the statements relative to the usefulness of quinine in fevers generally. No doubt a sufficient dose will lower the febrile temperature, and that its frequent repetition will keep the temperature normal, but at the same time the patient becomes greatly depressed, and greatly inconvenienced by deafness, headache, loss of appetite, etc., so that any advantage arising from the reduction of the febrile temperature is more than counterbalanced by the toxic effects produced.

Quinine, strongly recommended by Corrigan, is also extolled by others in pneumonia. Two to three grains should be given every two or three hours.

Quinine has but little effect on hyperpyrexia.

Maragliano, using the hydroplethysmograph of Mosso, finds that a febrile temperature is preceded and accompanied by contraction of the cutaneous vessels, and that during the decline of the fever the vessels of the skin dilate. He therefore concludes that Traube is right in regarding retention of heat as one cause of fever, though he regards increased formation as another cause. Maragliano finds that antipyretics, such as kairine, antipyrine, thalline, quinine salts, and sodium salicylate dilate the vessels of the skin both in febrile and afebrile persons, and so increase the discharge of heat. They also lessen the amount of carbonic acid expired, showing that they also lessen the formation of heat; in both ways they will meet the febrile state.

Quinine is often given with decided advantage to check the profuse sweating of exhausting chronic diseases, such as chronic phthisis. If a small dose fail to check sweating a large dose of six or eight grains, administered at once, or in portions repeated hourly, will sometimes succeed.

In many cases of profuse sweating a night draught, composed of quinine, sulphate of zinc, and sulphuric acid, is very useful.

Quinine is sometimes useful in the vomiting of pregnancy. Many American writers believe that quinine strengthens the contractions of the womb during delivery, and some use it in preference to ergot. Other writers deny this action to quinine, though upon the rather inconsequent ground that, when given during pregnancy for ague, it does not induce premature labour; some writers have, however, contradicted this last assertion.

Quinine is often employed with much benefit in diseases of malnutrition, as, *e.g.*, in impetigo and ecthyma. It is also of great benefit to the pale and badly-fed inhabitants of large populous towns. It is at present undetermined whether its good effects are dependent on its action upon the stomach or upon the tissues after its absorption into the blood. Quinine has been recommended in passive bleeding, undue suppuration, profuse menstruation, spermatorrhœa, and in excessive secretion of milk—conditions, that is, which as rule are supposed to indicate want of tone, local or general.

Quinine appears to be useful in some cases of intermittent hæmaturia, but to be quite useless in others.

Some doctors highly recommend the sulphate of quinine, in five-grain dose, in lumbago.

After administration quinine is found in the blood, which is a better solvent than water, in the saliva, bronchial mucus, milk, and in dropsical effusions. It is said to be eliminated slightly with the sweat, although Briquet, after giving large doses, could detect none.

Both quinine and cinchonine pass off in part by the urine, but a portion appears to be consumed in the blood, or to be eliminated in some other way. Kerner says that "a respiratory power of 3,000 c.c. destroys fifteen grains of sulphate of quinia in twenty-four hours; any amount over this will pass into the urine." Quinine appears in the urine of healthy individuals in the course of two to five hours, but more quickly in young than in old persons. In some diseases (intermittents, pulmonary emphysema, pneumonia, morbus Brightii) its exit is much protracted, and in three cases in which large doses were given, Dietl detected it in the urine many weeks after the last dose; this would show that it is not easily destroyed in the body.

Kerner finds that large doses of quinine diminish the excretion of urea, uric acid, creatine, phosphoric, and sulphuric acids.

Dr. Ranke has made the important observation that a scruple of disulphate of quinine lessens by one-half the excretion or the formation of uric acid, the effect continuing about two days after a single large dose, the other constituents of the urine remaining unaffected. It would seem likely that the uric acid is not simply retained in the system for, inasmuch as in Ranke's cases no subsequent increased excretion took place after the effect of the quinine had gone off, its formation must have been absolutely lessened, or it must have been converted into some other substance. (Parkes on *Urine*.)

Certain circumstances modify the operation of the salts of quinine. The physiological or therapeutic effects appear early in young people, who can resist the toxic action of the drug, but, on the other hand, the toxic effects of quinine are more marked in old people. Diffusible stimulants, such as wine and coffee, are said to counteract the action of quinine.

We may repeat that the effects of quinine may be obtained in the usual way by administration by the mouth, or by rectal administration, or by hypodermic injection; that the last is the most potent method, but should not be employed excepting in cases which are severe and rebellious to the more usual methods. For hypodermic use some recommend the acid sulphate of quinine of strength 1 in 10, dose 4–18 minims; others the more soluble acid hydrobromate, 1 in 6, dose 3–12 minims; the acidity, in each case, should be the least possible.

Of special bark preparations we may refer to Warburg's tincture, the formula of which has now been published. It has been specially employed in malarial affections, and has also been used extensively in the later stages of influenza. Its dose is 1–4 drachms; it contains besides spirit, some aromatics, camphor, and a small proportion of opium, also aloes in appreciable amount, so that it is an aperient preparation. Warburg's tincture is still sold under patent seal, but in this form is much more expensive.

SALICYLIC ACID, SALICYLATES, SALICINE

Salicylic acid is a phenol derivative, it is an oxybenzoic acid; it may be obtained from certain organic combinations in plants, *e.g.*, from salicine, a glucoside, present in varieties of salix, also from the oil of winter green, which is a methyl compound of salicylic acid; it may also be built up synthetically by heating together carbolic acid and caustic soda in an atmosphere of carbolic acid.

Salicylic acid is very insoluble in water; salicylates vary much in this respect, but the sodium salt is freely soluble; salicine is only sparingly soluble in water.

Salicylic compounds of synthetic origin are sometimes comparatively inefficient or they may give rise to toxic symptoms; in such cases we should have recourse to the salicylic compounds of natural organic origin before abandoning the treatment.

Salicylic acid is a powerful antiseptic. Wagner maintains that it is a more powerful disinfectant of wounds than carbolic acid, but this is not generally accepted. It is said to be three times more effectual in preventing fermentation than carbolic acid. Kolbe asserts that the salicylates possess no antiseptic properties, and that the apparent contradictions to this statement are due to the specimen used containing some free acid.

It is often used in place of carbolic acid, as an antiseptic for wounds, thus surgical dressings, *e.g.*, wool, impregnated with salicylic acid, are in frequent use.

Salicylic acid, given hypodermically, is efficacious in anthrax, but it is less effective than carbolic acid.

Da Costa employs salicylic acid in five-grain doses to correct the foul breath and offensive expectoration sometimes occurring in phthisis. Berthold, of Dresden, narrates a case which yielded promptly to salicylic acid, after the failure of turpentine inhalations, and large doses of quinine.

Berthold has likewise employed salicylic acid topically in "catarrhal stomatitis" and in thrush. He calls attention to the anæsthetic virtue of the acid in stomatitis, in calming the gnawing, burning pain of the erosions after the rupt[illegible]tion he uses is, one part of acid dissol[illegible] of a sufficiency of alcohol.

Salicylic acid has been used with good results as an injection (1 to 300) in the dysenteric diarrhœa of children.

A four per cent. solution is useful in pruritus and chronic urticaria; such a solution could be obtained by the aid of borax, *e.g.*, 20 grains of salicylic acid, 25 grains of borax—water, one ounce (*Extra Pharmacopœia*). Salicylic acid lotions are recommended in some cases of eczema. A one per cent. solution in vaseline or Oleum deelinæ is useful in eczema.

I have used the following ointment in pruritus ani and vulvæ with considerable success, though in some cases it has caused a good deal of smarting:—Acid. salicyl., ʒij.; ol. theobrom., ʒv.; cetac., ʒiij.; adipis vel vaselini, ʒiss.

Salicylic acid is much used as a local application for corns and warts. The following is Mr. Gezou's formula:—Salicylic acid, 30 parts; Ext. cannab. Ind., 5 parts; Collodion, 240 parts. It is applied with a camel-hair brush. It is said that the corn comes off in four or five hours, but no doubt it is simply the collodion film which peels off.

Salicylic acid diluted with starch and talc forms the pulvis salicylicus cum talco of the German Pharmacopœia (Salicylic acid, 3 parts; starch, 10 parts; talc, 87 parts). This forms a useful dusting powder to control excessive perspiration.

Salicylates sometimes produce rashes, such as urticaria or erythema.

Salicylic acid in very small proportion, 1·5 parts in 1,000, is useful pharmaceutically to keep in a stable condition solutions prone to decomposition, *e.g.*, solutions of cocaine (Martindale).

Bartholow recommends salicylate of soda in gastralgia and in fermentations in the stomach.

Salicylic acid in large doses lowers blood-pressure. It destroys life by paralyzing the respiratory centre, though some maintain that it is by paralyzing the heart.

In order to produce any of the characteristic symptoms of salicine, a single large dose of one drachm or more is necessary, or we may give thirty grains, repeated hourly, for two or three times. Given less frequently, or in smaller doses, the drug induces no symptoms whatever. Toleration is soon established, so that at last large doses fail to produce any characteristic effect; though when given at first, without any graduation, these full doses may produce very decided symptoms, persisting for one or two days perhaps, and even becoming intensified the day after the withdrawal of the medicine. The repetition of large doses may produce slight fever; this may be seen in the delaying and marked lessening of the normal evening fall[1]—an effect probably due to irritation of the stomach.

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[1] This refers to the late evening fall; the temperature is thus unduly sustained at a high level.

Smaller doses of salicylate of soda are sufficient to induce toxic effects, *e.g.*, ten to fifteen grains every hour or two hours; the greater solubility of the sodium salt probably explains this.

The aspect of a patient under full medicinal doses is rather characteristic, being in many respects similar to that of a person suffering from cinchonism. The expression is dull and heavy, the face quickly flushes on slight excitement, and the eyes become suffused. The flush, of rather a dusky hue, suffuses itself uniformly over the whole face. The patient, more or less deaf, often complains of noises in the ears. He complains too, of frontal headache, and his hands, when held out, tremble a little. His breathing is rather quickened and deepened. Not unfrequently, especially after large doses, nausea and vomiting ensue. In some cases one or other symptom may predominate; thus, deafness may be almost complete, without headache or muscular trembling; or the breathing may be characteristic, and the limbs may tremble, without headache or deafness; but it rarely, if ever, happens that any symptom is unaccompanied by the dull, heavy aspect, and the readiness to flush.

Under toxic, but not dangerous doses, the headache is often very severe, so that the patient buries his head in the pillow. There may be very marked muscular weakness and tremor, associated with great muscular irritability, so that a slight tap, say on the shoulder, causes muscular contractions so strong as to jerk the arm backwards. There are often slight spasmodic twitchings when a limb is raised. Tingling of the extremities or other parts of the body sometimes occurs. Further, the voice may become thick and husky, the respiration hurried, sometimes deepened, sometimes sighing and shallow, and almost panting, as though it were performed rather laboriously, though the patient does not complain of any difficulty of breathing. When the breathing is deep and hurried, both inspiration and expiration are often accompanied by a nasal, sniffing noise. The costal as well as the diaphragmatic movements are involved in the exaggerated breathing. Large doses, often repeated, quicken the pulse to 140 per minute, and it becomes very weak. Vision may be affected, the sight becoming dim, and strabismus or ptosis may occur—symptoms, however, I have never witnessed.

Patients taking salicine or salicylates often complain of great giddiness and of a feeling of intoxication on walking.

Sometimes patients are made delirious, the delirium often closely resembling delirium tremens. It may be accompanied by involuntary evacuation of urine and fæces. Delirium is often of the busy kind. In some cases when salicylate of soda has excited delirium, if the drug be discontinued and then again in a short time repeated, it will not the second time produce delirium.

Salicylate of soda sometimes excites acute nephritis, with bloody albuminous urine containing casts.

In addition, these substances sometimes produce sickness, and more rarely diarrhœa, so that they cannot be continued; further, salicylic acid often causes much distressing burning of the throat. When administered in fever, salicylic acid and the salicylates not uncommonly excite very abundant perspiration, but this did not occur in my experiments on healthy persons. While administering these remedies in rheumatic fever, some observers have seen them produce an urticarial or vesicular eruption. These symptoms, Stricker asserts, appear sooner in the old and feeble than in young and vigorous people. Dr. Dreschfield describes the case of a patient suffering from diphtheritic nephritis, in whom salicylate of sodium caused rigor, fever, a temperature of 103°, frequent pulse, severe headache, drowsiness, dry, brown tongue, nausea and vomiting, an erythematous rash on the face, chest, and arms, and increase of splenic dulness. I find that salicine does not reduce a normal temperature. Riets states that salicylates reduce the normal temperature 1° Fah., but I have not found this to be the case.

Salicine, salicylic acid, and salicylates, whilst influencing the normal temperature but little or not at all, depress powerfully a febrile temperature, and they have been abundantly used for this purpose. With the fall of temperature profuse perspiration occurs. Salicylate of soda is now used almost exclusively, for it is more soluble than salicylic acid and cheaper than salicine.

Though I have, on very many occasions, given salicine to fever patients in doses sufficient to produce deafness, headache, and muscular tremor, I have never seen it induce the quick and great reduction of temperature which follows the use of salicylic acid.

Salicylate of soda is not much used now as an antipyretic in acute specific or inflammatory fevers, for though no doubt it will hold down the temperature, it generally does more harm than good by the depression and discomfort which it produces; moreover, though in sufficient doses it is capable of keeping the fever temperature down, it does not shorten the course of the disease.

Several observers have employed salicylic acid in ague, but with contradictory results: thus some have obtained no benefit, whilst others have found that it cured a minority of the cases, being most serviceable in those of recent origin. It seems useful occasionally as an adjuvant to quinine, Sarzance having obtained good results from a combination of these remedies.

These compounds are, however, most valuable in acute rheumatic fever. Dr. Maclagan, in this country, and Dr. Senator, in Germany, first employed them in this disease. Ten to fifteen grains of salicylate of soda, hourly, is generally sufficient to relieve pain within a few hours, and to remove all fever within three or four days. Now, indeed, we never see cases of rheumatic fever running a protracted course of one or two months.

It is a good plan to give the medicine hourly till slight toxic effects, such as deafness and buzzing, are induced, and then to administer it every two or three hours. The therapeutic effect is not prompt nor marked unless some slight toxic symptom is present.

It is claimed for these remedies that they lessen heart complications in rheumatic fever. No exact observations have been made on this question, but, as Dr. Maclagan observes, it is obvious that a remedy which greatly shortens the duration of the disease must lessen the risk of complications. It does not, however, afford perfect protection to the heart, as several cases of pericarditis are recorded where this complication has set in after the patient was well under the drug's influence. This, indeed, we should expect, as the pericarditis is similar to the inflammation of the joints, and whilst this lasts, risk of heart complication must be encountered.

Perhaps the best treatment of all is to combine the alkaline and salicylate treatments, by administering with the salicylate the bicarbonate or citrate of potash. The alkaline treatment is held to lessen the risk of complications, and shorten the duration of the disease.

The combined dose may be given in effervescing form.

I may draw attention to a fallacy to which, I think, most of those who have reported on these substances have not paid sufficient heed; nearly all state that in twenty-four to forty-eight hours these agents exert a marked influence on the temperature and pain. In all the recorded cases which I have met with the patients were treated in hospital, and on admission were at once put under salicylic treatment. Now, it is well known that the movement of the joints during the journey to hospital considerably increases both pain and fever, and that during the first two days in hospital the pain greatly diminishes, and that the temperature falls by one or two degrees. When, therefore, the patients have been at once put under salicylic acid treatment this improvement in the pain and fever, due really to the rest, has been credited to the drug.

Acute rheumatism, subdued by the salicine treatment, is very liable to relapse, and the drug, reduced in quantity, should therefore be continued for ten days or a fortnight after the temperature has become normal.

Dr. Sharkey and Dr. Ord, and my experience confirms them, find salicylates of little use in hyperpyrexia, for this may occur whilst the patient is under the influence of the drug. Moreover, even when given in full dose, at the very onset of the pyrexia, it fails to control it.

A solution of salicylate of soda applied to inflamed joints in rheumatism gives much relief.

Salicylate of soda is very useful in some forms of chronic rheumatism. I have not been able to satisfy myself that it is of use in rheumatoid arthritis. It is certainly useless in gonorrhœal rheumatism. If the pain of chronic rheumatism is worse at night, then a dose of thirty grains should be given at bedtime. Its action is much helped by adding a full dose, *e.g.*, half a drachm to a drachm, of citrate of soda.

It is useless in gout.

Salicylate of soda, in my experience, succeeds better in sciatica than any other remedy. Sometimes its effects are very prompt, at other times it has to be continued for a month or three weeks. It is very useful also in lumbago.

Salicylate of soda is recommended in various forms of neuralgia, but, with the exception of sciatica, it is certainly inferior to other remedies.

It is extremely useful in migraine. Fifteen to twenty grains will generally, within a short time, remove the headache, sickness, and the dull stupid feeling so often present during these attacks.

Dr. Hunt first recommended salicylate of soda in quinsy. It is extremely successful, shortening the disease, and almost always preventing suppuration. It is probably the best remedy for quinsy, excelling even aconite or guaiacum. It should be given in small doses, such as three grains hourly. It will be remembered that tonsillitis is often of rheumatic nature, or is liable to occur in the rheumatic.

Ebstein and Julius Müller report two cases of diabetes mellitus cured by salicylate of soda. They do not vaunt this remedy as a specific, but the two interesting cases they cite, after a prolonged trial of various drugs, and notably of carbolic acid, got well under the salicylate of soda.

We may add that an allied drug, antipyrine, is credited with curative powers in diabetes.

Salicine and salicylic acid may be readily detected in the urine, sweat, saliva, and sputa, by the purple colour produced on the addition of a drop of the solution of perchloride of iron. It appears in the urine in four or five hours, and seems to undergo speedy elimination, though a trace may remain after four days' discontinuance of the medicine.

It is stated that these drugs appear in the urine in the form of salicyluric acid. Dr. Sharkey has detected salicylic acid in the urine, in the serum from a blister, in the expectoration, but, strange to say, not in the sweat, of patients taking salicylates.

Dr. Pye-Smith points out that the urine of patients whilst taking salicylic acid gives the reaction of sugar with Trommer's test.

A little syrup of orange peel or of ginger covers the mawkish taste of salicylate of soda. Twenty drops of hydrobromic acid with each dose prevents the buzzing of the ears produced by salicylates; for this purpose bromides act equally well.

SALOL

SALICYLATE of phenyl is decomposed in the intestine by the action of the pancreatic ferment into salicylic acid and phenol, about two-thirds salicylic acid and one-third phenol. It is insoluble in water, and has a slight aromatic taste.

It acts just like salicylic acid, and most observers ascribe its action to the salicylic acid it contains, though some maintain that it is more efficacious than salicylic acid as an antiseptic and antipyretic.

As a dusting powder, diluted with an equal part of talc or starch, it is useful in erysipelas. The same powder sniffed up the nose removes the fœtor of ozæna. Like salicylic acid, it has been employed as an antipyretic in phthisis, typhoid fever, etc., and some writers praise its action highly. In my hands, like all other antipyretics yet introduced, salol has done more harm than good in these affections, and I gather that this is the growing opinion of others, as it is now not much used as an antipyretic pure and simple.

It is highly useful in acute, subacute, and chronic rheumatism. Some think it more efficacious than salicylic acid. To me it has appeared to be valuable, simply because of its component salicylic acid. It has to some people a less disagreeable taste than salicylate of soda, and when this salt disagrees, salol is often tolerated. It produces the same toxic symptoms as salicylate of soda, and, in fact, affects the patient in all respects like this drug. It is useful also in neuralgia and lumbago, and probably in sciatica.

The dose is ten to fifteen grains hourly. It may be taken in wafer-paper, or suspended in water. Patients, I find, take it easily in aerated waters. I conclude that it acts simply as a salicylic acid compound, and that all the good and evil which it possesses is to be found in salicylate of soda, over which it has the advantage only in taste, and in the fact that it is sometimes tolerated by the stomach when salicylate of soda induces nausea and sickness. I may here state, however, that, not uncommonly, when sickness is induced by large doses of sodium salicylate, given every three hours, one-third of this dose given hourly is well tolerated.

Salol passes off by the urine as salicyluric acid, but some would seem to escape unchanged. At least, the urine and the breath smell very like the powder. The carbolic acid of salol may cause carboluria, the urine being liable to acquire the characteristic dull-green or green-black colour of this affection. It prevents decomposition of the urine, and is said to prevent the occurrence of this in the bladder in cystitis; also to keep the urine acid.

Salol has been used as an intestinal antiseptic in typhoid fever, though in this affection this same antiseptic method has not yielded any very striking results.

SALICYLATES AND SALICYLIC DERIVATIVES

NUMEROUS compounds, which may be regarded as variations more or less intricate of the fundamental salicylic molecule, have been introduced into medicine of late; thus we have a long list of salicylates of inorganic and organic bases, *e.g.*, salicylates of sodium, potassium, and ammonium, of bismuth, of calcium, of iron and of mercury, and, further, salicylates of quinine, of caffeine, of methyl, of phenyl, of naphthol, etc. Besides these we have more complicated products by substitutions in the salicylic molecule. Some of the complicated bodies on the pharmacist's list may not represent true chemical compounds, but be rather of the nature of mixtures or solutions. However this may be, the purpose which these many compounds are intended to serve is to present again and again the fundamental salicylic action accentuated or corrected or associated with some other action adapted to some special morbid condition. Thus in salicylate of sodium we have a salt which, on account of its free solubility, is a suitable vehicle of salicylic action pure and simple; in salicylate of phenyl (salol) we have a drug which by breaking up into salicylic acid and carbolic acid yields two strong antiseptics which will co-operate; in salicylate of quinine we get a dissociation which will yield somewhat similar results, or in which, perhaps, an antipyretic action may be more prominent; in salicylate of bismuth we have a compound which by dissociation, perhaps, will assist the sedative bismuth action by adding to it an antiseptic action. These few remarks may assist one to group these numerous compounds, and to select from them on occasion, at any rate, with an attempt at rational prescription. The list of compounds is too long and the individual members in many cases too untried to permit of detailed consideration here; some have been already briefly mentioned under separate headings.

ANTIPYRINE OR PHENAZONUM

THIS compound goes by the official name of Phenazonum, but it is more commonly known as Antipyrine. As the latter name implies, it is possessed of antipyretic powers, and it was introduced principally because of these powers, though it possesses others of importance. It is typical of a large group of similarly acting substances, most of which are of recent date.

Antipyrine is classed by Bernthsen among compounds which may be regarded as transitional to the aromatic compounds, *i.e.*, to the benzene derivatives proper; it was introduced into practice by Filehne. It acts promptly as an antipyretic, effecting a fall of several degrees within two or three hours; the fall often endures for more than twenty-four hours, to be then followed by a very gradual rise. There is a fall in the pulse which is, however, not always equal to the reduction in the temperature. With the fall of the temperature the symptoms improve, the tongue grows clean, delirium disappears, and restlessness ceases. The drug interferes neither with the appetite nor with digestion. It produces, generally, a copious perspiration, but sometimes there is only slight perspiration, with, however, an increased secretion by the kidneys. In rare instances it excites vomiting. It sometimes produces an erythematous rash, somewhat like measles, leaving a brown stain, most marked on the trunk. This rash disappears in spite of the continued administration of the drug. At times the eruption is more of the nature of an erythema, sometimes with weals, urticaria-like, sometimes with bullæ, resembling pemphigus; sometimes it is hæmorrhagic. Free desquamation, especially when the eruption has been bullous, may ensue. The mucous membranes may suffer, and coryzal symptoms appear.

Since it may cause some cardiac depression, antipyrine should be given guardedly to prostrate patients. The tendency to cause depression, especially cardiac, with more or less lividity and more or less proneness to faint, belongs to the whole group of which antipyrine is a member.

The blood appears to suffer some changes, at any rate, from large doses, methæmoglobin making its appearance.

It is said to reduce the normal temperature one or two degrees, though it has no effect on the normal daily cycle of temperature.

It has been given in typhoid fever, pneumonia, erysipelas, rheumatic fever, and phthisis. In these affections it may reduce the temperature below normal, even to 93° Fah., without producing any collapse, and it has succeeded where the cold bath, quinine, and salicylate of soda have failed. On the other hand, it may cause serious collapse.

There is no proof at present that it shortens the course of disease; it appears to be only a reducer of the febrile temperature.

Many observers have recommended antipyrine in three hourly-doses each of thirty grains, and then that the drug should be intermitted till the temperature again rises, or that smaller doses, such as fifteen grains, should be taken several times a day. The tendency, from further experience, however, has been to reduce the dosage very considerably, and three ten-grain doses at intervals of one hour would now represent a full dosage.

At first the accounts of the effects of antipyrine were very enthusiastic, but it is much seldomer prescribed than awhile ago, and after many trials, I must confess I find that, like other antipyretics, it may cause so much distress and depression that in many cases it does more harm than good, though I think it is less depressing than some other antipyretics.

In doses adequate to lower temperature efficiently it often induces vomiting. After the reduction, the temperature, as it rises again (the medicine having been eliminated), is often accompanied by chilliness, or even violent rigors. Thirty grains given, in single dose, at intervals of twelve or twenty-four hours, are said to depress less than smaller doses more frequently repeated. It is, however, better to give at first a fifteen or twenty-grain dose to test the patient's susceptibility to the drug, or to give the drug in ten-grain dose as above mentioned.

It has been maintained that antipyrine is as useful as salicylate of soda in acute rheumatism. This I am sure is an error, and that in this disease antipyrine cannot compare with salicylate of soda. Antipyrine will lower the temperature like other antipyretics, but on discontinuing the drug the fever and pain return.

Sée drew attention to the great usefulness of antipyrine in many painful affections, such as migraine, neuralgia, sciatica, lumbago, muscular rheumatism, the pains of locomotor ataxy and angina pectoris.[1] It may be given in fifteen-grain dose three to six times a day, or half that dose twice as often. If given in doses larger than fifteen grains, it may cause methæmoglobinuria. It is highly useful in migraine; sometimes it succeeds in twenty-grain dose, whilst other patients may require thirty grains; in some cases a twenty-grain dose may have to be repeated in an hour or two hours. Idiosyncrasy is at times very marked for this drug.

Sée administered it hypodermically to relieve the pain of neuralgia, acute and chronic rheumatism, acute gout, biliary colic, renal colic, angina. It is also said to be useful in a paroxysm of asthma, promoting expectoration. Antipyrine is soluble in an equal quantity of water. Five to fourteen grains in such solution may be administered, and if the injection cause much pain, a little hydrochlorate of cocaine may be added.[2]

Antipyrine has been recommended to relieve dysmenorrhœa and the pains after delivery, also the pains of parturition; in the latter case it is said to lessen the suffering without diminishing the force of the uterine contractions.

Several compounds of antipyrine (? in some cases mere mixtures) are in use, *e.g.* with chloral, monochloral-antipyrine (hypnal), also with salicylic acid (salipyrine); the former, as its name, hypnal, implies, has hypnotic powers. It is useful in 15–20 grain dose in insomnia. It is supposed to have an especial influence over pain.

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[1] This analgesic power of antipyrine is firmly established. The drug, in France, goes by the name of Analgésine.

[2] In the *Extra Pharmacopœia* (Martindale and Westcott) a hypodermic solution, containing cocaine in addition to antipyrine, has the following strength: Each 10 minims contain 5 grains of antipyrine and $\frac{1}{12}$ grain of cocaine.

Antipyrine should not in general be prescribed with other drugs, because it is liable to break up by interaction with them ; it has, in other words, a long list of incompatibles.

PHENACETINE

An acetyl compound of phenetidine, closely allied to acetanilide (antifebrine), has established its claims to recognition as a useful antipyretic. It occurs in colourless crystals, without taste or smell, very insoluble in water, fairly soluble in spirit. Its dosage is five to ten or fifteen grains; its administration is in powder, in pill, cachet, or tabloid, or in suspension in some mucilaginous fluid.

Phenacetine acts very similarly to antipyrine, and it is useful in the same affections both as an antipyretic and an analgesic. It is advanced in its favour that it is safer than antipyrine, being much less liable to cause symptoms of collapse or to be followed by the development of a rash; it may, however, in full dose, cause symptoms of depression, and a phenacetine rash has been recorded. It has the advantage of being cheaper than antipyrine. In toxic doses, phenacetine has produced very pronounced symptoms of depression with blood changes (methæmoglobinuria). Its action as an antipyretic is held to be by lessened heat formation (H. C. Wood).

ANTIFEBRINE OR ACETANILIDE

This drug is sometimes named Phenylacetamide. It is a direct substitution product obtained by the interaction of aniline and glacial acetic acid ; structurally, it is, as stated, very closely allied to phenacetine. It occurs in colourless, odourless, crystals which have a slightly burning taste ; they are comparatively insoluble in water, though more soluble than phenacetine. They are readily soluble in alcohol and ether and in chloroform. Antifebrine is administered in pill or in cachet, or suspended in water by mucilage. The dose is a smaller one than that of either phenacetine or antipyrine ; it is given in 1–4 grain dose, or this may be advanced to 10 grains ; the average dose will be 4 or 5 grains.

Antifebrine has the same mode of action as antipyrine, both as an antipyretic and as an analgesic ; the indications for it are the same therefore. The toxic effects of over-dose, collapse, cyanosis, rash, etc., are similar.

Antifebrine is comparatively little prescribed now, though some observers speak highly of it.

Antifebrine is sometimes prescribed in measles, and Whitla recommends it as a safe treatment, though not necessary in the ordinary routine. He recommends half a grain every three hours for a child of one to two years. In the case of an older child with severe symptoms and ill-developed rash, a dose of two or three grains will often act very beneficially in bringing out the rash. Antipyrine is also prescribed in measles. Whitla recommends two grains of it (in place of the half-grain of antifebrine) as an alternative treatment.

EXALGINE OR METHYLACETANILIDE

In this compound we have a drug of comparatively recent introduction, which has very decided powers of allaying pain. Its name, exalgine, points to this. It belongs to the same class of bodies as the preceding, and in particular comes very near in structure to antifebrine and phenacetine. In addition to its powers as an analgesic, it is also antipyretic and antiseptic, but it would appear that to produce antipyretic action it is necessary to employ doses which are otherwise unsafe, and practically it is in use as an analgesic only. Fraser has recommended it highly in various forms of neuralgia, and he was successful with it in small dose, ½–2 grains, but many recommend a larger dosage, viz., 3, 4, or even 5 grains. Whitla gives 3–4 grains, three or four times daily, and relieves "almost all forms of neuralgia, migraine, sciatica, and every painful affection in which antipyrine has been successful."

The toxic effects of exalgine include marked depression, general and respiratory, also cyanosis.

Exalgine may be given in pill or powder; being difficult of solution in water, but fairly soluble in dilute spirit, it must, if given in mixture, be dissolved by the addition of spirit. Helbing (*Modern Materia Medica*) proposes a solution of four grains of exalgine, one drachm of tincture of orange peel, forty drops of syrup of orange, water to half an ounce—this to represent the single dose.

OTHER ANTIPYRETICS, ANALGESICS, AND ANTISEPTICS

Many other bodies of the same class as the preceding have been introduced. Thus there have been Thalline, Kairine, Resorcine, Hydrochinon, etc.; but those already mentioned may be regarded as most representative and as most in use; and we must refer to special treatises for further information concerning these others. We may, however, here make mention of certain benzene derivatives which are in not infrequent use on account of their antiseptic powers, viz., Naphthalene and Naphthol (α and β).

Naphthalene has the formula $C_{10}H_8$; it is a hydrocarbon, which may be regarded in a sense as built up by the amalgamation of two benzene rings. Naphthol, α and β (two isomers) result from the replacement of one of the atoms of hydrogen of the naphthalene group by hydroxyle; the formula is therefore $C_{10}H_7(OH)$.

Naphthalene occurs in white crystals, which have a peculiar gas-like odour, are insoluble in water but soluble in ether, hot alcohol, fats, and volatile oils.

In the mouth naphthalene has a somewhat burning taste.

It is a powerful antiseptic, and has been used as such externally, in the treatment of unhealthy wounds, but it cannot claim any special advantage over other external disinfectants; it has, however, been advanced as peculiarly adapted to intestinal disinfection in typhoid fever and in cholera, because of its insolubility, and therefore innocuousness. Poisonous symptoms have, however, been recorded (renal and hæmic); possibly they have been caused by impurities, and to avoid this Helbing states that only naphthalene re-crystallized from alcohol should be dispensed.

Napthalene has been recommended as a safe anthelmintic by Mirovitch in doses of 15 grains for adults (children, 5–8 grains), along with castor oil and bergamot as a corrective (*see* Helbing).

The dose in general is from 2–15 grains, in cachet or pill.

Naphthalene has, to a considerable extent, given way to the use of β naphthol; this is a white crystalline substance, occurring in scales or in powder, with a faint aromatic odour and slightly burning taste, but little soluble in cold water (fairly so in hot water), soluble in the same menstrua as naphthalene. It is used externally as a disinfectant and, in the treatment of skin diseases, such as would indicate the use of tar, it has been applied both in alcoholic solution (2 to 10 per cent.) and in ointment form, with vaseline (3 to 10 per cent.). Internally it has been given, in pill or cachet, as an alimentary tract disinfectant both in typhoid fever and in cholera, in diarrhœa and dysentery, also in dilated stomach, this last being accompanied by incomplete emptying of the stomach and fermentations of the retained liquids. The dosage is 2–15 grains. It is well in some cases to give it along with bismuth carbonate, say 10 grains of the latter with 5 or 10 grains of β naphthol, in cachet.

As previously stated, on more than one occasion, the antiseptic treatment of typhoid fever has not proved very successful, and it is not gaining ground; but if an intestinal antiseptic is desired we have in β naphthol an efficient one.

Both naphthalene and β naphthol may be given in keratine-coated pills, this will hide, in the former case, the objectionable taste and smell.

α Naphthol has been employed and is eulogized by some, whilst others regard it as very poisonous (Binz). There is no object in having this remedy on the therapeutic list.

BITTERS

These constitute a class of drugs of secondary importance, yet very useful, and much used. Bitterness is a quality which belongs to substances differing widely in chemical constitution; thus it is found to characterize such important drugs as the alkaloids, strychnine and quinine; on the other hand, it is found to characterize a number of neutral principles present in the class now under consideration, and which include such drugs as Quassia, Calumba, Chiretta, Gentian, Cusparia, Cascarilla, Orange-peel, Serpentary, Chamomile, Dandelion, Hop, etc.[1]

The first three members of the list just given, but quassia, *par excellence*, may be regarded as nearly pure bitters, little beside the bitter principle being present. Gentian may also rank as a tolerably pure bitter, though it also possesses some astringency. The others either contain astringency or aroma, or both.

The bitters are prescribed either as extracts or as tinctures and infusions. The chief of their action seems to be of the nature of a direct stimulant action upon the mucous membrane of the alimentary tract; as a result of this, a better digestion is effected, and, in consequence, an improved assimilation. The action of these substances hence causes an improved tone of the whole body, and hence they are often spoken of as tonics or bitter tonics; but whether the improved tone is in any part the result of absorption of the bitter principles, or depends entirely upon the local effect upon the alimentary mucous membrane, and the improved assimilation thereby effected, it is difficult to determine.

The action is perhaps in preponderance upon the stomach, and on this view the term "stomachic" is frequently applied to this group.

The conditions of body which indicate the bitters are, first, general want of tone, such as obtains in particular during convalescence from acute disease, and which is, as a rule, accompanied by alimentary tract atony, shown by anorexia and inability to digest or assimilate; next, various forms of dyspepsia, especially the atonic forms, marked by poor appetite and broad, pale, flabby tongue, tooth-indented; then, certain of the more acute forms of dyspepsia with furred tongue.

In general it is best to begin with the administration of the purer bitters, Quassia, Calumba, Chiretta, Gentian, and especially if there be simple digestive enfeeblement, as during convalescence, or if there be any tendency to "biliousness." A mineral acid, and especially the nitro-hydrochloric, will be advantageously combined with the bitter, or, if there be irritative symptoms present, an alkali with or without bismuth may replace the acid.

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[1] Nux vomica, though occupying a very special position, is often used, and must be associated with the list of simple bitters.

If flatulence be a marked symptom, an aromatic bitter may be more effectual than a pure bitter (though the latter is never out of place), or we may even enforce the aromatic effect by the addition of volatile oils, such as oil of cajeput, or peppermint, or cinnamon.

If anæmia accompany general and alimentary want of tone, iron may be given with the bitter, which is then by preference quassia or calumba.

Nux vomica is an excellent adjuvant in many cases of dyspepsia with furred tongue. (*See* Nux vomica.)

Taraxacum is credited with especial powers in liverish states, it may be given with acid or alkali. It is held to be cholagogue.

Serpentary is held to *possess* alterative powers, and it is spoken highly of by Sir A. Garrod, in the treatment of certain forms of chronic gout.

One of the pleasantest bitters is the Virginian prune, which, moreover, has special advantages, owing to the presence of amygdaline and emulsine which, generating some prussic acid, confer a sedative action upon the drug. The tincture is prescribed in half-drachm dose.

Quassia is poisonous to some of the lower creatures, such as flies and other insects.

Infusion of quassia is a very useful injection in ascarides; it is also efficacious in this affection when administered by the mouth.

Chamomile flowers contain both a volatile oil and a bitter substance, and thus, to some extent, combine the properties of bitters with those of ethereal oils.[1]

Chamomile is not often used as a tonic. An infusion is sometimes employed to assist the action of emetics.

In the ordinary summer diarrhœa of children, often occurring during teething, and characterized by green, many-coloured, and slimy stools, the infusion of chamomile in doses of half a drachm or a drachm often proves very useful, especially when given at the commencement. This medicine is likewise efficient in other kinds of summer diarrhœa. It also subdues restlessness and peevishness. A mixture is easily prepared by steeping four to six heads of chamomile flowers in a teacupful of boiling water for an hour, and then giving a teaspoonful hourly.

It has been used in intermittent fever, in neuralgia of the fifth nerve, and it is a popular remedy for "sick headache."

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[1] In a case of accidental poisoning by chamomile the symptoms were diarrhœa of white putty-like stools, coated tongue, intense headache, with a sensation of pressure within the cranium.

PAREIRA BRAVA

THIS plant, the root of which is officinal, occupies no very clear position. By some it is placed among the ill-defined group of the alteratives along with Guaiacum and Sassafras; by others it is classed with such drugs as buchu, bearberry (Uva ursi), juniper, and the like, drugs, *i.e.*, with such as exert an especial action upon the genito-urinary tract, and since this is the main action of pareira it is, perhaps, best placed with these latter. It is, however, a bitter tonic, also, and often increases the appetite, and it appears to give tone to the alimentary tract and to obviate costiveness. On these grounds it may claim to be placed near the bitters.

Pareira contains an alkaloid, buxine, said to be identical with berberine. It is chiefly employed in chronic catarrh of the bladder, and is in many cases a most valuable remedy, checking bleeding, and, more gradually, muco-purulent discharge. It often arrests promptly any bleeding from the bladder, though, strange to say, it has no control over bleeding from other organs. It must be given in considerable doses, such as a drachm and a half to two drachms or more of the liquid extract three or four times a day.

I have treated cystitis patients who have taken this remedy with intermissions for several years, and in whom its suspension was immediately followed by a return of the bleeding and a considerable increase of muco-pus in the urine.

Pareira is also prescribed in chronic gonorrhœa.

We pass to some of the more important purgatives.

ELATERIUM

ELATERIUM is the dried sediment obtained from the fresh juice of the squirting cucumber. Its activity is due to elaterin, a chemically indifferent substance incapable of forming salts with either acids or bases. The drug has a very bitter taste, and excites a free secretion of saliva.

It is a powerful drastic hydragogue cathartic. It often produces colic, and not unfrequently vomiting.

In large doses it may excite inflammation of the stomach and intestines, and even of the peritoneum. It is given as a purgative, especially in dropsies. By carrying off a large quantity of water the dropsy is sometimes reduced; it is thus used both in ascites and in the dropsy from kidney or heart disease. It must, however, be borne in mind that free purging is very exhausting, and that elaterium very often disorders the stomach and spoils the appetite. It is a medicine to be given, therefore, with caution.

Dr. Hyde Salter strongly recommends the use of purgatives in dropsy depending on aortic-obstructive, or regurgitant disease. He says, that although we cannot alter the heart, we can lessen the quantity of blood it has to propel, and can thus diminish the congestion on which the dropsy depends. He enploys elaterium, and advises a small dose at first, say one-sixth of a grain, to be given alternate mornings at about 5 a.m., so that the purgation may usually cease by ten or eleven. This treatment, he says, quiets the heart, relieves the dyspnœa, lessens the pulmonary congestion, and thus diminishes the hydrothorax.

The vomiting which elaterium sometimes excites may constitute a difficulty in its administration. The initial dose of elaterium should not exceed $\frac{1}{8}$ grain, and Wood advises that it should be qualified by the addition of extract of henbane and some volatile oil. The initial dose of elaterin should not exceed $\frac{1}{20}$ grain, unless the condition be one of great urgency.

Elaterium or elaterin is sometimes employed in apoplexy, according to the view that free purgation will relieve cerebral hyperæmia.

COLOCYNTH

AN active principle, colocynthin, a glucoside, resides in the pulp of the colocynth fruit.

The drug has an intensely bitter taste, and it occasions an abundant secretion of saliva.

It produces diarrhœa, colic, and sometimes vomiting. The diarrhœa is watery, and, after large doses, serous, mucous, and bloody. In large doses it may excite gastro-enteritis and peritonitis.

It is chiefly used as a purgative, but almost always in combination with other substances. In obstinate constipation it is a good plan to give a few drops of the tincture of the German Pharmacopœia several times a day. Röhrig, from his experiments on fasting animals, is led to place colocynth high among cholagogues. It makes the bile more watery, but also increases the solid constituents. It stimulates powerfully the intestinal glands.

It has been used as a drastic cathartic in dropsies, and, like most other powerful purgatives, it has been used for worms, although it has no direct poisonous influence on them, but merely expels them mechanically. Purgatives, therefore, are not sufficient anthelmintics.

ALOES

ALOES has been used as a slight stimulant to wounds, and when thus employed it often purges. "Dr. Gerhard, of Philadelphia, found it the medicine best adapted for endermic use, as its application does not irritate a blistered surface very powerfully. Ten grains of aloes thus employed produced five or six stools, which were generally accompanied by griping. Infants are purged by the milk of nurses who have taken aloes." (Stillé.)

Aloes is reputed to be a tonic, and to increase the secretion of bile. Dr. Rutherford confirms Röhrig's statement, that when introduced into the duodenum of a fasting dog, aloes greatly increases all the biliary constituents, though it purges but slightly.

It is chiefly employed as a purgative. It acts mainly on the large intestine and rectum. Its action is slow, and six, twelve, or even twenty-four hours may elapse before it operates. It produces bulky motions, a little softened, but not watery. It evidently acts but little on the mucous membrane of the intestines, and is merely a fæcal evacuant. It often occasions slight griping, and sometimes tenesmus. As its action is tardy, it is injudicious to combine it with speedily acting purgatives. It is well suited for cases of chronic constipation; for its activity is not lessened by habitual use, and it is even said that the dose may be gradually decreased. Sulphate of iron is said to heighten its action.

In habitual constipation aloes is the best and most commonly employed purgative. Dr. Spender, of Bath, extols the following pill, taken at first three times, then twice, and afterwards once a day—one grain of watery extract of aloes, and two grains of sulphate of iron. This pill takes some days to act; the dose should be reduced, as above stated, on the occurrence of any tendency to relaxed stools. Aloes has been accused of producing piles, and in full or over-doses will, no doubt, aggravate this disease, but most authorities are inclined to attribute piles to the constipation which aloes is employed to remove, and not to the aloes itself. Indeed, I am convinced that in many cases moderate doses of aloes, just sufficient to gently relieve the bowels, are highly useful in piles.

When both a tonic and a purgative are required, aloes, like senna, may be usefully mixed with some bitter, such as gentian. Purgatives, it is said, act in smaller quantities when combined with tonics.

Aloes, in a variety of combinations, is in common use as a laxative in habitual dyspepsia, with constipation. The compound decoction of aloes, formerly called baume de vie, is a serviceable after-dinner laxative. The basis of many dinner pills is one grain of watery extract of aloes. A dinner pill containing one grain of watery extract of aloes, combined either with extract of nux vomica, extract of gentian, or extract of cinchona, is very useful.[1]

Aloin, the active crystalline principle of aloes, injected hypodermically, purges in a few hours. It should be dissolved in twenty-five parts of water. Aloin is a neutral body, chemically.

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[1] Guaiacum is useful in obstinate habitual constipation; and guaiacum mixture will often relieve the bowels when powerful purgatives fail.

By its action on the rectum aloes affects sympathetically the neighbouring pelvic organs, *e.g.*, the uterus, and given at, or just before, the menstrual period, it is useful in many cases of amenorrhœa and deficient menstruation. We cannot here refrain from citing the admirable remarks of Dr. Graves on amenorrhœa and its treatment. "The periodicity of this function," he says, "can still be traced, even in cases where suppression has continued for a great length of time, by means of the menstrual molimina (pains in the loins, thighs, and hypogastric region, flushings, colicky pains of the abdomen, general feeling of *malaise*), which occur at stated intervals. In endeavouring to bring on the discharge, therefore, we must be guided as to the time the attempt should be made, by an observance of the period at which these molimina occur. For a few days before that time our efforts to produce a determination of blood to the uterus may be judiciously employed, and if they fail the attempt should be abandoned until a few days before the next menstrual period. Of course I do not here speak of the general constitutional treatment, for this must be constantly persevered in, one of the chief means of bringing back this evacuation being the restoration of health to the natural standard. In some this is to be effected by a tonic, and in others by an opposite mode of treatment.

". . . What I wish to impress on your minds is, that all those remedies, as pediluvia, stuping of the genitals, leeches to the inside of the thighs near the labia, aloes, and other stimulating purgatives, etc., should be only used at the times already spoken of. To use them at any other period, either after the molimina have disappeared or during the intervals between them, tends in most cases still further to derange nature, by determining to the uterus at an unseasonable time, when there is no natural tendency to that organ. Under such circumstances the very same means will frequently fail, and prove injurious, which, applied so as to coincide with the time of the natural effort, would have been successful. To illustrate these principles by an example:—We are consulted in the case of a young woman affected with various hysterical symptoms for several months, and during that period more than usually subject to headache, languor, loss of spirits, diminution of appetite and irregularity, and usually constipation of bowels; she is pale, and complains of various pains and uneasy sensations, and has not menstruated since the accession of these symptoms. Here it is evident that the constitutional treatment must be strengthening and tonic. The practitioner will therefore recommend regular hours, much passive exercise in the open air, a nutritious diet, and afterwards cold shower-baths; he will regulate the bowels, and afterwards prescribe a course of tonic medicines, chalybeates, preparations of bark, strychnia, etc.; he will likewise inquire carefully when the last period happened, and when and how often since that occurrence menstrual molimina were observed. He thus ascertains when they should again recur, and contents himself with enforcing the constitutional treatment until about six days before the calculated time. Then he lays aside the other medicines, and has recourse to those means which determine to the uterus. Two leeches are applied to the inside of the thigh, near the labium, every second night, until they have been three times applied. The bleeding is encouraged by stuping. On the intermediate days the bowels must be actively moved by aloetic pills, and for three nights before and after the molimina, hot pediluvia, rendered stimulating by mustard seed, may be used. During the same time also friction, with stimulating liniments, should be applied to the feet and legs every morning, and oil of turpentine, or tincture of cantharides may be exhibited internally, while the necessity of more active exercise is inculcated. If these means fail, they must for a moment be laid aside, and the constitutional treatment must be again resumed until the same number of days before the next period, when the list of remedies above spoken of must be again tried, and in few cases indeed shall we find them to fail." (Graves' *Clinical Lectures.*)

Aloïn is administered in doses of one half to two grains; taken continuously as in a dinner pill, half a grain is often very efficient, or even smaller doses. Alkalies are said to promote the action of aloïn. Andrew Clark's dinner pill consisted of half a grain each of aloïn, extract of nux vomica, sulphate of iron, myrrh and soap; the pill to be taken shortly before the late dinner.

JALAP, SCAMMONY

BUCHHEIM asserts that these two substances are rendered purgative only by combining with the bile, and that unmixed with this secretion they are inert. They are easily soluble in the bile, and probably undergo decomposition, but the products which result are unknown. Taurin and glycocoll exert no influence on their efficacy, but it is otherwise with tauro-cholate and glyco-cholate of soda; hence Buchheim concludes that the activity of these drugs is determined by the soda of the bile. Jalap and scammony excite a diarrhœa of watery motions, with some colic and occasional vomiting, and their use is often followed by much constipation.

These medicines are used as purgatives in obstinate constipation, and jalap, in combination with other substances, is employed in dropsies. Scammony is frequently used with much advantage to destroy the small thread-worms which infest the rectum.

Röhrig and Rutherford conclude from their experiments on fasting dogs that jalap is a powerful cholagogue; it increases the watery and solid constituents of the bile, and powerfully stimulates the intestinal glands.

Dr. Rutherford finds that scammony given to fasting dogs is but a feeble cholagogue, even when it purges.

In engorgement of the right side of the heart from emphysema and bronchitis, mitral obstructive or regurgitant disease, bleeding has again been employed and with some success. Now, for some years I have employed purgatives in these cases with considerable benefit, and I venture to say that this treatment, first employed by Dr. Graves, saves and prolongs many lives; the purgation should be to the extent of three or four watery motions daily.

Like bleeding, free purging unloads the distended, and therefore weakened right heart, and in bronchitis it produces moreover a very favourable change in the character of the expectoration, rendering its expulsion easier. The following case, one among many similar ones, benefited by free purging, will illustrate the advantage of this plan.

A woman about forty years of age, suffering from emphysema, was seized with severe bronchitis. She had been dangerously ill about a fortnight, her skin was of a deep leaden tint, her eyes were prominent, congested, and suffused, her jugular veins were greatly distended, the surface of her body was covered with a cold clammy perspiration, profuse on her face, her extremities were deadly cold, her temperature varied between 97° and 98° Fah. She suffered from slight delirium both night and day. Her breathing was hurried, but the chest expanded only slightly, expectoration was abundant, viscid, airless, and purulent; the pulse was large, but very compressible—it varied from 96 to 100 beats in the minute. The respiratory sounds were obscured by an abundance of mucous rhonchus, and physical examination showed that the right side of the heart was greatly distended. The urine contained a trace of albumen; the legs were not œdematous. So dangerously ill was the patient that death appeared imminent. After free purgation with jalap and bitartrate of potash, the jugular veins, within a few hours, became much less distended, and by the next day they were of natural size, and the deep leaden tint of the skin had given place to a diffused bright red colour, a change often witnessed in cases treated in this way. This change in colour was due to the capillaries becoming filled with arterial instead of venous blood. The bright red colour was most marked over the face and hands; the skin became warm, though the patient continued to perspire freely; the hands, however, easily grew cold on exposure. The patient expressed herself as much relieved. Within twenty-four hours the expectoration became slightly aërated, this change being much more marked on the following day, when the expectoration was observed to be less purulent and to contain much mucus. On the third day the expectoration was frothy, and consisted chiefly of mucus. Coincidently with this improvement in the sputa, the chest expanded more perfectly, and the rhonchus diminished. From this time onwards she steadily improved, and was discharged cured.

The engorgement of the right heart, with general venous congestion is no doubt apt to return, and then it may become again necessary to purge; indeed, several purgings may be required. It will rarely happen, I believe, that the venous congestion will not be removed temporarily by this treatment.

The change in the expectoration takes place sometimes more slowly than in the foregoing case, a week elapsing before it becomes frothy, and composed of mucus. Any tendency of the expectoration to assume its old characters may be prevented by a repetition of the aperient.

Sometimes patients of this class complain of very severe dull headache, or of dull oppressive pain at the epigastrium: bleeding or purging relieves both symptoms, bleeding giving instant ease.

In persistent tricuspid regurgitation from permanent distension of the right side of the heart, induced by repeated attacks of bronchitis, purgatives will probably be of no use except when an attack of bronchitis, adding to the obstruction of the pulmonary circulation, increases the dilatation.

For the dropsical effusions of chronic Bright's disease the most effective means of treatment are, according to Sir W. Roberts, hydragogue cathartics and warm baths. He says, "For general use there is no hydragogue superior to the compound jalap powder, with an additional quantity of the bitartrate. It acts quickly and procures two or three copious watery stools." To lessen the inconvenience from the tendency to nausea and sickness which this treatment may occasion, he advocates that an "active dose (for an adult, ʒiij. of the bitartrate and 15 or 20 grains of jalap corrected with a little ginger) should be administered early in the morning twice or thrice a week." This, he says, is less harassing to the patient than the use of a less active dose daily.

In the treatment of acute Bright's disease also, and in uræmia, jalap is an excellent purge.

The usual purgative dose of the *compound* jalap powder will be some 45–60 grains: it will be noted that in the above formula of Roberts, the dose of jalap referred to is of the tuber itself and not of the compound powder.

Scammony either in the form of the gum resin (scammonium) or of the resin itself is rarely given alone, this applies to most of the more powerful hydragogue purgatives. Whitla recommends specially the combination of scammony with calomel, *e.g.*, 5 grains of scammony resin with 3 grains of calomel for an adult. For a child a year old a good formula is 2 grains of the *compound* scammony powder and ½ grain of calomel (Great Ormond Street Hospital), in this there will be one grain of scammony resin; it will be dispensed as a powder of course.

RHUBARB

Rhubarb is a purgative, and likewise a tonic. After purging it constipates, on which account it is often used in the early stages of diarrhœa, to get rid of any irritating intestinal matters, and, after their expulsion, to check the diarrhœa. For this purpose a drachm of the compound rhubarb powder (Gregory's) serves excellently for adults. It may be given mixed with water or more pleasantly in cachet. If the heavy magnesia be used in place of the light a less bulky dose will be obtained. It is a very useful purgative for children, especially when mixed with two or three times its weight of bicarbonate of soda. For a child a year old some three grains of rhubarb would form a suitable dose.

Röhrig finds that rhubarb, given to fasting dogs, increases greatly all the constituents of the bile, though the rhubarb either failed to purge, or purged very slightly; Rutherford verifies this observation.

Dr. Stillé, on the authority of Dr. S. Jackson (U.S.), whose testimony he endorses, speaks of rhubarb as a remedy of surprising efficacy in piles, when laxatives are needed. He directs a piece weighing about ten grains to be chewed, or rather slowly dissolved in the mouth, nightly, or less frequently, according to the degree of constipation, estimating that rhubarb taken in this fashion is five-fold more efficacious than the powder. He also recommends it in the costiveness and hæmorrhoidal swellings incident to pregnancy (Stillé's *Therapeutics*).

Rhubarb generally colours the urine a reddish yellow, which, on the addition of ammonia and other alkalies, changes to a purple red. It colours also the sweat, the serum of the blood, and the milk; and it makes the milk bitter and purgative.

It may be usefully blended with some tonic.

According to Binz, the chief purgative principle of rhubarb is a body allied to cathartic acid; besides, there is the colouring and cathartic principle, chrysophanic acid. A tannic acid accounts for the subsequent constipating action of rhubarb.

SENNA

Senna is an active purgative, promoting both secretion and peristaltic action. It often produces nausea and griping. It may be usefully combined with a bitter tonic, as in the mistura gentianæ composita.

of former pharmacopœias. This mixture is very useful in dyspepsia with constipation, it contains an ounce of the compound infusion of gentian to half an ounce of the compound infusion of senna, and about one drachm of the compound tincture of cardamoms.

To the value of this Dr. Hare bears testimony: he recommends it either as a dose *per se*, or as a vehicle for other remedies; it was Abernethy's prescription.

Senna renders a mother's milk purgative, and may produce colic in the child.

Röhrig and Rutherford find that in fasting dogs senna slightly increases the secretion of the bile.

It is a chief constituent of the compound liquorice powder. On the usefulness of the various preparations of senna we need not insist, they are household remedies.

The active principle of senna is cathartic acid. It is present in combination with lime and magnesia (Binz).

CASCARA SAGRADA

One of the buckthorn family, derived from Rhamnus purshiana. Like the other buckthorns, it is purgative, but less drastic than rhamnus cathartica, and more active than rhamnus frangula. It acts promptly and without griping, and is now largely used with great advantage as a laxative, especially in habitual constipation.

It may be given as the liquid extract in ten to fifteen-minim dose twice or thrice a day, or in the form of the extract in doses of two to four grains in a pill at bedtime.

Cascara has deservedly come to the front rank in the treatment of habitual constipation; it and aloes may be said to compete very closely for supremacy, though perhaps cascara is even more frequently prescribed in this affection. Innumerable preparations of cascara have made their appearance—elixirs, syrups, tinctures, etc. There is perhaps no better preparation than the liquid extract, the dose of which should, according to Fraser, not exceed twenty minims, it may however be repeated twice or thrice daily if needful. Fraser considers that the larger doses tend to produce piles.

Whitla insists wisely that the great point in the administration of cascara is to graduate the dose to the individual, and that, upon any tendency to purgation, the dosage should be diminished, the object to be attained being one satisfactory action daily. He further urges that at the outset the physician should insist upon a two months' course; this is very necessary, for it is essential in the combating of one habit that we should secure time enough for the establishing of an opposite habit.

Cascara is not adapted for occasional purging.

Very useful pills are now obtainable which contain, it is claimed, the active principle, cascarine.

The unpleasant taste of cascara may be obviated by the use of capsules, or we may endeavour by tinctures and syrups to form palatable elixirs.

EUONYMUS

THIS is used in the form of a dry extract, known also as euonymin, in about two-grain doses, as a purgative and stimulant to the liver; it is said to increase the secretion of bile. Large doses cause much intestinal irritation. A short time ago it was employed much more than at present, in the place of mercury or podophyllin preparations.

Though much less used now, it is no doubt a useful drug, but I hold it to be inferior in most cases to its rivals, mercurial preparations or podophyllin.

ANTHELMINTICS—

FILIX MAS,
KOUSSO,
KAMALA,
SANTONIN,
TURPENTINE,
ARECA NUT,
BARK OF THE POMEGRANATE ROOT,
POWDERED TIN,
MUCUNA, ETC.

THE intestines are infested by worms of various kinds. The common kinds are the flat worms (Tænia solium, T. mediocanellata and Bothriocephalus latus); the round worm (Ascaris lumbricoides); and the thread-worm (Oxyuris vermicularis).

Worms may be treated in three ways. Drugs, such as powdered tin, and mucuna, may be employed to kill the parasites by their mechanical action simply, or powerful purgatives may be used to expel them, such as jalap, scammony, etc.; or true vermicides, having very little effect on the tissues of the human body, but toxic to the parasite may be used to poison and kill the worm. With the exception of powdered tin and mucuna, all the medicines comprised in the foregoing group are vermicides. It must, however, be borne in mind that all are not equally efficacious against every kind of worm, for some are poisonous to one kind, and harmless to another. Success, in fact, depends not only on giving the fitting drug, but on giving it in the right way. These medicines should reach the worms in as concentrated a state as possible, and if the stomach and intestines are filled with food, the poison being thus diluted, may fail to destroy the worms. It is proper, therefore, to give overnight a purgative, and to direct the patient to take a very light tea and no supper, and on the following morning, after the purgative action, to give the anthelmintic.

Filix Mas is employed for tape-worm. Küchenmeister asserts that it is more poisonous to the bothriocephalus than to the tænia solium. The patient should eat a very light tea, no supper, and just before bedtime swallow a dose of castor-oil, a purgative to be preferred to others on account of its speedy action. On the following morning, about six or seven o'clock, when the oil will generally have acted, the liquid extract of male fern is to be given in dose varying from ten drops to a drachm, according to the age. The patient is then to abstain from food till the bowels have been freely relieved, when in most cases the worm will be expelled. Some recommend a brisk purge to follow the anthelmintic, but this is seldom necessary, as the foregoing simple plan rarely fails to dislodge the worm. Too large a dose of the male fern may cause nausea, sickness, and even colic, effects seldom witnessed with a moderate dose. The liquid extract of male fern is slightly purgative, and for this reason it is not always necessary to administer a purgative after it. The worm should be carefully examined in order to ascertain if the head has been expelled; in that case there is no fear of the re-growth of the worm. It has, however, been ascertained, that if only the head and a small piece of the neck are left the worm will die, so that even if the head cannot be discovered, it must not be concluded that the patient is not permanently freed of the worm. If then any piece is found which tapers to a fine point, even if the head is not attached, it may reasonably be hoped that the worm is destroyed. A good plan to obtain for examination all the expelled worm is to shake up the motions, already watery and loose from the purgative, with some water, and to filter the whole through a piece of coarse muslin, by which means the head, even if separated from the trunk, may be detected and examined.

Male fern is generally considered the fittest treatment for the flat worm.

Kousso is used for tape-worms of all kinds, and appears to be very successful, although not much employed in this country. In Abyssinia, where tape-worm is extremely common, kousso has been in use for upwards of two centuries. The dose is half an ounce of the flowers suspended in water, and taken after a short fast, as in the previous case. Küchenmeister asserts that kousso expels the worm slowly, and in pieces, and that it rarely expels the head. It may cause slight nausea and even vomiting. Its action on the bowels being very slight, it is customary to follow this drug by a mild purgative.

The bark of the root of Punica granatum is another anthelmintic in use. It is employed in India chiefly for tape-worm. Neligan directs the maceration of two ounces of the bruised bark (of the fresh root if possible), for twenty-four hours in two pints of water; this is to be then boiled down to half the quantity, strained, and divided into three doses, one to be taken at half-hour intervals. Vomiting often occurs, this, however, should not prevent the giving of the three doses. This treatment should be repeated occasionally, for four or five days in succession. Most practitioners find the dried root inert.

Landriew and Baumetz find that the alkaloid of POMEGRANATE, pelletierine, is useful for tape-worm. Fifteen to twenty grains of the tannate, followed in a few hours by castor-oil, will sometimes succeed when other remedies have failed. Feraud cured, completely, 76 per cent. of his cases with this alkaloid.

KAMALA is much used in India for tape-worm. It may be given in doses of from 60 to 120 grains, in honey, syrup, or glycerine. It purges briskly.

ARECA NUT is much used by veterinarians to expel tape-worms from dogs, and may be employed for the same purpose in the human subject; it succeeds sometimes when other remedies fail. Half or a whole nut is to be powdered, then mixed with some syrup, and swallowed.

Neligan commends TURPENTINE for both the tape and the round worm, it is, however, more deadly to the tape-worm. Turpentine should be given in 4-drachm dose with one ounce of castor oil, it may however produce strangury and other unpleasant symptoms, and should therefore be kept in reserve and used, Filix mas failing. It is also efficacious when used as an injection for thread-worms. Küchenmeister has shown that it destroys tape-worms within an hour.

SANTONIN, the active principle of worm seed, so called, is very efficacious for round and thread-worms, but it is inoperative against tape-worms. In the treatment both of round and thread-worms, two to four grains, according to the age, are to be mixed with a drachm or more of castor-oil, and taken early in the morning before breakfast, repeating the dose two or three mornings successively. Such treatment seldom fails to bring away any round or thread-worms. Santonin has been used, mixed with castor-oil, as an injection into the rectum for thread-worms, and Küchenmeister found that santonin in castor-oil, mixed with albumen, killed ascarides in ten minutes, while without the oil the santonin had no effect. He, therefore, recommends it to be given in two to five-grain doses in an ounce of castor-oil. This quantity is of course intended for adults. Santonin may be conveniently given in syrup, lozenge, or ginger-bread. In an obstinate case some advise the administration of one or two grains twice or three times a day, but repeated as often as this the medicine is very apt to occasion sickness and vomiting, with great difficulty in holding the water; hence children, if overdosed with it, are apt to wet the bed at night, and are constrained to pass water very frequently, and may be even unable to hold it by night or day. Santonin colours the urine an orange hue, which changes to a brilliant scarlet on the addition of solution of ammonia. It is curious that this remedy will sometimes stay the nocturnal incontinence of children; and even when the incontinence is not dependent on the presence of worms, santonin succeeds occasionally where other remedies, including even belladonna, fail. It may produce headache, and sometimes it affects the smell and taste; occasionally it makes objects appear of a green or yellow colour. Rose finds that santonin always produces hyperæmia of the retina, and he and Dr. Ogston believe that the colour is owing to its influence either on the retina or brain, since it does not colour the structures of the eye.[1] Drs. Ogston and Brown assert that santonin has produced cataract in the eyes of young kittens, but they have been unable to induce this condition in adult cats. These gentlemen recommend santonin in certain eye diseases, such as inflammatory and atrophic alterations in the retina and optic nerve, producing deficient sight.

Raimondi and Bertini record a case where an ounce of santonin induced vomiting, giddiness, prostration, shivering, lividity, and difficult breathing, followed by repeated epileptiform convulsions. The patient recovered.

Mr. Whitehead, of Manchester, finds santonin useful in amenorrhœa. He gives a ten-grain dose on two successive nights with almost uniform success, especially when the amenorrhœa is combined with chloro-anæmia.

Dr. Amand Routh tried santonin in twenty cases of amenorrhœa, giving ten grains on two successive nights. In seventeen the drug failed. He thinks it useless in amenorrhœa with chlorosis. When santonin succeeds it starts the discharge without pain.

Santonin may be conveniently given (in form of a suppository) for thread-worms.

Of all medicines to be swallowed, santonin is, as we have said, the most effectual against thread-worms, which parasites are said to infest the rectum only.[2] Scammony appears, also, to be effectual against thread-worms.

A variety of substances administered by injection will speedily destroy thread-worms. Thus, a large teaspoonful of common salt in solution in a tumblerful of water, or an infusion of quassia, or a drachm of sesquichloride of iron in a pint of water, are very efficacious injections; so also is lime-water, solution of alum, and, in fact, any substance which will coagulate the albumen of the worms.

In the treatment of worms it must always be remembered that the mucous membrane is generally in an unhealthy state, secreting much tenacious mucus, which forms a favourable nidus for the development of worms; worms will rarely develop in a healthy state of the digestive canal. The foregoing modes of treatment are therefore only temporarily remedial, and after the expulsion of the worms the morbid condition of the intestinal mucous membrane must be treated. This condition of the intestines generally occurs in unhealthy anæmic children. Cod-liver oil and iron preparations soon restore the gastro-intestinal canal to a healthy condition.

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[1] There seems to be some doubt on this point, some holding that the media are faintly stained.

[2] Cobbold controverts this, and maintains that they infest the whole of the large gut, and may even be in excess in the cæcum.

Oils, as is well known, are reputed to be vermicides.

If the foregoing remedies fail, other medicines must be employed to remove the catarrhal state of the mucous membrane, such as common salt, chloride of ammonium, and salts of antimony. Cold-sponging and out-door exercise, with a judicious diet, aid the improvement of the general health.

The two following medicines have affinities elsewhere, and are generally classed with the stimulating expectorants, such as the balsams, the fœtid gum resins, etc. Chemically they differ widely from these, and perhaps they are best in a separate group by themselves.

SQUILL

CONTAINS several glucosides—scillitoxin, scillaïn, scillitin.

Squill has a bitter taste. In full doses it acts powerfully on the stomach and intestines, exciting great nausea and vomiting, with frequent watery and even bloody diarrhœa. Similar symptoms are likewise produced when the drug is injected into the cellular tissue, or peritoneal cavity.

Squill is, however, never used as an emetic or purgative, but almost exclusively as an expectorant in bronchitis, and it is generally given in the later stages of this affection. Milner Fothergill used to maintain that the drug should not be given till the pulse became soft and the skin moist; therefore, not till the more acute stage of a bronchitis had passed off.

Squill acts like digitalis. This is a very important part of its action, and on many grounds it is often classed with digitalis. Thus it retards the heart and raises the blood-pressure; the latter partly by an increased ventricular energy, partly by a peripheral contraction of the arterioles. Like digitalis it acts as a diuretic; in part probably by raising the blood-pressure, as does fox-glove.

Squill is hence a diuretic in heart disease, and it is specially indicated in dropsy of cardiac origin. It is given also in other forms of dropsy, but an acute inflammatory condition of the kidney is held to contra-indicate it.

It is often combined with digitalis, and it is of special value when, in addition to cardiac disease, there is a bronchitis with much mucous secretion.

An excellent combination is found in most hospital pharmacopœias; it is known as the "diuretic pill," and contains one grain each of digitalis, squill, and blue-pill.

The indication of over-use of squill will be found in the occurrence of symptoms of gastro-intestinal irritation.

SENEGA

Senega promotes the secretion of the bronchial mucous membrane, and probably that of the other mucous membranes. It produces a burning, itching sensation in the mouth and throat.

Senega contains a glucoside, variously called, but closely allied to, if not identical with, saponin.

It is used in chronic bronchitis, especially in the case of aged people, in whom this disease is usually complicated with emphysema. Some give it in croup and in whooping-cough. It is also reputed to be diuretic, and it has been used when the deficiency of urine is due to kidney disease. "Infusion of senega (four to six drachms infused in six to twelve ounces of water, and taken during the day) produced no effect on the urine in Böker's experiments, conducted on himself and on a pregnant woman." (Parkes on *Urine*.)

The chief use of senega is as a stimulating expectorant, and in the chronic affection, as also in the later stages of the acute disease, it is very useful. The combination of senega with squill is an excellent one.

SERUM THERAPEUTICS

This class of remedy has sprung into notoriety, not to say fame, within an incredibly short space of time. It is held by many to inaugurate a new era in the history of treatment, to mark an essential departure from older methods, and to put us in possession of means of combating disease wholly different in kind from those we have hitherto relied on. Doubtless a step of the utmost importance has been taken, and to minimize its significance or ignore the immense possibilities which it opens up would be equally foolish, but, at the same time, it would be yet more disastrous if we were forced to the conclusion that this new adventure involved a break with the old, and cast discredit upon former ways and means. We need, however, have no such fear, for, as matters really stand, this newer treatment depends not upon any new principle of application, but upon a more intimate knowledge of the chemistry of the tissues and the vital processes of the lower forms of life. We have learned something of the importance to the economy of the class of organs known as the ductless glands, and that even in the case of those glands which possess definite ducts, not all the virtues elaborated pass along the duct. Having learnt this much concerning that which is sometimes named the internal secretion, it was a comparatively simple step to search in these glands for the active principles which must represent their individual value to the system, and, in cases of deficiency, to supply the defect. In like manner, from the study of those diseases in which pathogenic organisms form an essential part, it appeared that these latter elaborate chemical products of greater or less toxic power, and that hence, to a very large extent, these diseases may be regarded as toxæmias. To determine the nature of these toxins, to investigate the mode of reaction of the tissues to them severally, these steps followed in sequence, and they led up to the discovery of the reaction products, the anti-toxins, so-called, which tended to neutralize or overcome the toxins. To apply this knowledge came next, and it has brought us to the stage at which we now find ourselves.

Just as in the past products of plant or animal origin, at one time held to be producible by living tissues alone, have been built up synthetically in the laboratory, so it is more than probable that the complex bodies formed by healthy gland tissue in the ordinary course of normal metabolism, as also those other products which result during the processes of disease—the toxins and anti-toxins—will in the future be producible synthetically. In any case, whether this be feasible or not, these agents are not outside the limits of chemistry, and their action is subject to the same laws which regulate the actions of the simplest chemical bodies. We have hence no reason to regard the action of thyroid gland extract as more mysterious than the action of prussic acid or of arsenic, and, in a sense, the use of the former is more rational, less empirical. It is important to bear this in mind, because the startling results which have followed serum therapy in certain directions have certainly caused not a little mystification, and brought back upon us some of the dangers of mediævalism. So improbable, indeed, are some of the claims which have been put forward in respect of the animal extractives, that it would be well if all would start with this therapeutic axiom: That the greater the improbability of a proposed treatment, the greater must be the amount of evidence (by results) required to establish it.

Serum treatment falls into two categories:—

(1.) The use of serums, or extracts, obtained from organs or tissues derived from the bodies of healthy animals, in the treatment of diseases in which the corresponding organs or tissues are held to be at fault.

The term "isopathy" has been used to describe this method.

Upon this plan a case of myxœdema, with atrophied thyroid, is rationally treated by supplying to the organism the fresh thyroid of certain animals, or extracts from this gland. The treatment is thus supplemental, and it is marvellously successful. But when, upon this same plan, it is suggested that a case of granular kidney be treated with powdered sheep or pig's kidney, and we are told that the polyuria decreases (a symptom, by the by, which is probably conservative, *i.e.* beneficial), and that the general health improves, we are bound to receive such a statement with the utmost caution, and to judge it by French law. The same should hold with regard to the statement that extract of bullock's heart is a means of increasing the force and fulness of the pulse, the flow of urine, and the number of blood corpuscles.

(2.) The use of serums derived from the bodies of living animals which have been subjected to the influence of various pathologic micro-organisms, or of the products of their activity. Such serums are employed in the treatment of the diseases which these same micro-organisms generate when they gain access to the human body.

This subject is one of great complexity. On the face of it, it sounds homœopathic; examined into, its theory is essentially anti- or allopathic. It bids fair to yield us valuable remedies.

To go into the theory of this form of serum treatment is quite impossible here, but to give it a rational basis in however elementary a form will perhaps be a gain. Very briefly, then, we have the following facts:—

(*a*) A person who has passed through an infectious fever is found to be more or less protected from infection by the same poison which in the first place generated the fever. Either there is present in the body (of this person) something which is antagonistic to this poison, or the tissues have been so altered by the attack that they are less susceptible to the influence of the poison. We have here the clinical fact of protection.

(*b*) It has been shown for animals that the blood, and fluids generally, of the body, after an attack of an infectious fever, possess properties which are antagonistic to the development of the organism (of this particular infection) within the body of another animal. In other words, that these same fluids are antipathetic. Experiment has directly shown that by the injection of such fluids we may protect a healthy animal against a lethal dose of the poison in question.

(*c*) It has been further shown that the properties in question are possessed by the serum. Hence its use, and the name, *serum* therapeutics.

(*d*) It has been shown that in man the *developed disease* can be treated by the injection of the serums in question. In other words, that these fluids have the power not only of conferring immunity—of protecting—but also of *treating* the attack itself—curative powers. In its full sense, then, these serums appear to be antidotal.

(*e*) It is established that the mischief wrought by pathologic micro-organisms is by virtue of certain chemical products which they elaborate; the so-called toxins. Accordingly the name antitoxins applied to the antidotal serums is a simple statement of fact, though their mode of action is up to the present most difficult of comprehension.

It is probable that other poisons beside those of bacterial origin will prove to conform to the laws which apparently govern bacterial toxins. Calmette claims to have established this for the poison of snake-bite, a poison elaborated, however, by animal tissues, and Ehrlich to have demonstrated the same for the vegetable principles, ricin (from castor-oil beans), and abrin (from jequirity seeds). The latter observer states that, having established a tolerance for these substances in mice, he found that the serum of ricin and abrin-proof animals possesses the power of directly transmitting a resistance against ricin and abrin.

Should these statements receive general confirmation, the wide application which Behring's law will acquire will prove of fundamental importance, and a serious advance towards scientific therapeutics will have been made. Behring's law reads :—

"That if an animal has been artificially protected against a particular infective agent, its blood or serum acquires the power, when injected in sufficient quantity into another animal, of directly transmitting an immunity from that agent." [1]

May we be pardoned if we recall here Newton's law?—"That action and reaction are equal, and act in opposite directions. . . ." In other words, action generates its opposite—the toxin develops the antitoxin.

It would be almost as good as going back to Hippocrates if we could establish any treatment on the solid basis built by Newton.[2]

The protective power of serums has been demonstrated in animals for the following bacterial infections :—

Mouse septicæmia; Friedländer's pneumonia bacillus; Fränkel's pneumococcus; the typhoid bacillus; the vibrios of cholera asiatica; the Bacillus pyocyaneus; Streptococci and Staphylococci pyogenes; Bacillus prodigiosus; B. coli communis.

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[1] For this and much that precedes we must make special reference to Kanthack's clear exposition in his Jacksonian Prize Essay on "Tetanus Antitoxin," 1895.

[2] It is only right however to add that the question of immunity is a very complicated one, and that we may separate here the microbe from its toxin; thus it is possible to render the body immune against the products or poisons of bacillary life, though not against the bacilli themselves. To take an example, an animal may be immunized against the poisons of the tetanus bacillus, and yet the bacilli may be able to vegetate freely in the body of the animal. Doubtless these bacilli go on manufacturing their poisons, but these are antagonized as fast as produced. It is conceivable therefore that the immunity conferred might not last so long as the life of the bacillus and that this latter might then develop the effects of its unantagonized poison, or the immunization may be against the bacillus and not its products; it is thus for cholera and typhus. The ideal immunity must be against both the bacillus and its poisons. (*See* Koch, "Ueber Neue Tuberkulin Präparate," *Deutsche Med. Wochenschr.*, April 1, 1897.)

The immunity bestowed by the inoculation of these serums, in which are present antitoxins but no micro-organisms, is to be contrasted with that immunity which is conferred by an inoculation of the bacteria themselves along with their toxins. The former is termed by Ehrlich *passive* immunity, the latter *active* immunity.

Passive immunity is quickly effected, is less persistent, and varies with the amount of serum used and the degree of immunity acquired by the animal supplying the serum.

Active immunity does not appear for days, not, in fact, till the animal has passed through the stage of reaction occasioned by the entry of the poison. Then, however, it is more or less permanent, and in degree it is proportional to the intensity of the reaction rather than to the amount of vaccine used.[1]

If this be so, the use of antitoxin serums will be of chief value as a means of curing an attack, or of conferring a temporary immunity during the crisis of an epidemic.

As a means of ensuring permanent protection like that conferred by cow-pox vaccination, or the yet older method of small-pox inoculation, it promises less.

We have yet to learn to what extent the natural protection afforded by a given attack of an infectious disease is modified by the use of antitoxin serums in the treatment of the attack.

It should be added that, so far as we have yet gone, each specific micro-organism with its toxin develops a specific antitoxin within the living tissues, and this antitoxin is operative only against its corresponding germ and toxin; in other words, the action of each antitoxin is specific. Calmette disputes this for anti-venomous serum, which, he says, is operative against the bites of different species of snakes.[2] We must await further investigations upon this point.

Method of performing the injections:[3]—

The specific protective substance may be kept either in the liquid form or in the dried state after drying the serum in vacuo.

If in the dried state, it must be first carefully suspended and ground up in water or salt solution (0·6 per cent.), either vehicle having been first sterilized by boiling, or we may use sterile camphor or thymol water. The dried serum will dissolve only in part, and, after vigorous shaking and allowing the solution to stand and settle, the supernatant fluid is then to be injected.

The skin at the site of the injection must be carefully washed with some antiseptic lotion before puncturing.

The syringe and needle must be carefully cleansed immediately before and after each injection. Before the injection the needle and syringe and plunger should be boiled; directly after use the needle and syringe and plunger should be carefully cleansed, first with sterile water (boiled, but not boiling), then, after thorough washing, with absolute alcohol, and lastly with ether. Perhaps the use of the last-mentioned may be dispensed with. Boiling the syringe and needle *immediately after* the injection would lead to coagulation of the adherent serum, and make more difficult the subsequent cleansing.

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[1] Cf. Kanthack, op. cit., section xiv. [2] Ibid. [3] Ibid.

The injection is made directly under the skin, and accordingly where the bulk of the injection is large, the puncture should be at a spot where the skin is loose, *e.g.*, under the collar-bone, at the sides of the chest or abdomen, over the back, or into the buttock or outer part of the thigh. Absorption takes place rapidly, and it is not necessary to accelerate this by massage.

Where the bulk to be injected exceeds 25 c.c., the injection must be divided, and puncture made at two or more spots.

The serum, carefully prepared and preserved, is comparatively harmless, and for this reason the dosage should err, if anything, on the side of boldness.

Koch's official syringe is the best pattern, viz., a syringe without plunger, all the parts of which can be readily got at and cleansed, but a syringe with asbestos or specially prepared rubber plunger is in some ways more convenient, and it also admits of satisfactory cleansing. The needle should fit directly on to the glass of the cylinder without screw, as in Koch's syringe.

With the strength of serums now prevailing, the most useful capacity of syringe will be not less than 10 c.c.

Whilst practising injections for the treatment of bacterial infections, we must not neglect to treat, according to present methods, the local infection if accessible. Local antiseptic treatment will accordingly continue unchanged.

We will now take *seriatim* the various antitoxin serums, and then the tissue serums and extracts of the isopathic group.

Antitoxic Serum in the Treatment of Diphtheria.—This treatment, though still under investigation and not unlikely to undergo modification in its details, has passed the stage of preliminary trial. It has been very extensively used, and upon the basis of the statistics[1] so obtained, its employment is not only justified, but more or less urgently called for, in the severer cases of pharyngeal diphtheria and in the laryngeal group as a whole, in particular, in those cases of the latter group in which tracheotomy has been performed. In the extensive class of mild cases of pharyngeal diphtheria, and in the yet larger class of suspicious throat cases an immediate vigorous local treatment, the essence of which is frequent application, will, possibly, be all that is needed.

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[1] The lowering of the mortality in the Metropolitan Asylums Board Hospitals on all cases is less striking than that obtained on the Continent generally.

We shall do well to look for the indications for treatment, local or general, to clinical appearances rather than to the results of bacteriological examination. This for two reasons: (1) because we must wait at the least twelve hours, in general not less than twenty-four hours, before we can obtain these bacteriological results; (2) because in a considerable number of cases which, clinically, are diphtheria, and which show a mortality even slightly higher than the general diphtheria death-rate, one or more bacteriological examinations have failed to discover the specific germ.[1] But we can neither wait twenty-four, nor even twelve hours, before beginning treatment, nor can we overlook those cases which, as above stated, are to all intents and purposes diphtheritic, yet give negative results bacteriologically.

A vigorous local treatment should be maintained during the antitoxin treatment—this has been the practice at the Board Hospitals throughout[2]—and it is thoroughly reasonable that we should attack with antiseptics those foci of bacilli, where the poison is elaborated, at the same time that we treat the poisoned blood state.

As to dosage, it is the practice now to standardize the various serums in use according to the standard proposed by Behring as follows:—An arbitrary strength of diphtheria poison is first selected, of which a definite dose will kill a guinea-pig of fixed weight, within three days at most: next the strength of the *antitoxic* serum is measured by the amount requisite to neutralize a given dose of this poison.

Behring's unit of immunization is one cubic centimetre of antitoxic serum of such strength, that one part of it will neutralize ten parts of the normal diphtheria poison.

To neutralize the poison in the human body in a given case of diphtheria, 600 to 1,000, or even more, immunization units are in general required, *i.e.*, 600 to 1,000 c.c. of antitoxic serum of the above strength. These quantities would be far too large to be of practical use, and accordingly Behring sends out his serum in strength, 60 (No. 1), 100 (No. 2), or 140 (No. 3), times as great as the above serum. Of serums of these strengths, 10 c.c. will contain the required dose, and each bottle of 10 c.c. capacity sent out contains this dose; therefore 600, 1,000, or 1,400 immunization units respectively.

The Report of the Metropolitan Asylums Board Hospitals recommends that 1,000 Behring's immunization units should be injected every 12 hours for the first 24, 36, or 48 hours, according to the gravity of the case, and, "if necessary, a subsequent injection of half the amount daily for such time as the exudation membrane may remain adherent"

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[1] *See* Metropolitan Asylums Board Report upon the use of Antitoxic Serum in the treatment of Diphtheria during the year 1895 (p. 12).

[2] *See* also Escherich, Diphtheria, Croup, *Serum Therapy*, Wien, 1895.

(p. 27). This dosage has been regulated according to the severity of the case, rather than by the weight or age of the patient. In Merck's Annual Report the same initial dose of 1,000 units is given as the recognised dose.[1]

The syringe should be, therefore, of 10 c.c. capacity, and it may be either the ball syringe of Koch, without piston, or it may be a piston syringe with asbestos or special rubber plunger, as used by Aronson and others. Each instrument must be kept strictly aseptic. Whatever the fluid used, it should be seen that its strength is stated in immunization units upon the label, and that the dose administered contains the required number of units—600 to 1,000 or 1,400; also that the fluid comes from a source of repute. In this country there is the serum of the British Institute of Preventive Medicine, or that prepared under Dr. Sims Woodhead's direction at the laboratories of the Royal Colleges, also Klein's antitoxic serum, etc., or we may use the serum of Behring (Fabrik: Höchst-am-Main); Aronson (Berlin: Schering's Fabrik); E. Merck (Darmstadt); Roux (Institut Pasteur: Paris), etc.

At a higher price Behring's serum can be obtained in greater concentration than the above, so that 2 c.c., about 32 minims, contain the required 1,000 units.[2]

The serum, if kept in a cool place away from the light, may be preserved at the least several months; its keeping powers are increased by the presence of 0·5 per cent. of carbolic acid, and this allows any residual quantity left over after opening the bottle to be utilized within a short time of the opening.

The site of the injection should be into parts where the skin lies loosely, *e.g.*, below the clavicle, or into the sides of the chest, or abdomen, or into the back; the outer part of the thigh is a convenient site. Absorption takes place rapidly, and massage is not necessary to aid this.

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[1] In the Metropolitan Asylums Board Report for the year 1896, the dosage is placed still higher. It is there stated that for mild cases 2,000 units on the first day will be enough, "but when as sometimes happens the symptoms have progressed very rapidly even in a few hours, a larger amount must be given." No limit is however set to the number of units which may be injected without harm, except the limits of the bulk of the serum requisite. The stronger solutions now made contain, some 4,000 in 10 c.c., some even 8,000 units in 10 c.c. With such serums the advice given is to adminster in severe cases 8,000 to 12,000 units when the patient is first seen, and to follow this by 2,000 to 8,000 units every 12 hours for the next 24 or 48 hours or longer, according to the gravity of the case and the persistence of the local infection (p. 11 of the Report).

[2] America seems to have led the way in the use of higher grade antitoxin serums. The lower grade serums, Nos. 1 and 2 (Behring), are scarcely used there, and higher grades, Nos. 4, 5, 6, and 7, have been added to the list; these strengths contain, respectively, 200, 300, 400, and 500 units in *each cubic centimetre*. The advantage of the smaller bulk, of such serums, required for injection is obvious. (See *Lancet*, August 22, 1896, p. 558.)

For the reason that you can stay the poisonous action, but cannot undo the mischief which has taken place, it is important that the injection should take place early, *if possible, within the first three days*: statistics point clearly to the importance of this (Metropolitan Asylums Board Report, p. 13).[1]

The good effects of the serum are of two kinds, viz., upon the local process, a separation of the membranes and a prevention of extension of the same, and upon the general state, an improvement in the appearance and manner of the patient and, in general, the disappearance of the toxic symptoms. According to Escherich the septic cases of diphtheria are but little influenced by antitoxin. The effect upon the local process is often more demonstrable than that upon the general state.

Toxic effects to be ascribed to the injection of the serum are: the development of a rash, urticarial or erythematous; sometimes it is blotchy, sometimes measly, septicæmic or scarlatiniform in appearance; at times there is an accompanying pyrexia.

The rash generally appears about the end of the second week (11th to 14th day); it may appear earlier or slightly later. Further, there may be joint-pains, in a small percentage; pyrexia with or without rash or joint-pains in a certain number; abscess at the site of the injection, in some 2 per cent.

The normal sequelæ of diphtheria are not diminished by the treatment, indeed, the whole group appear to be increased—some, inappreciably, some, *e.g.*, albuminuria and paralyses more distinctly. There is, however, no proof that the tendency to nephritis, a rare sequel of diphtheria, is increased by antitoxin. On the whole, these drawbacks are insignificant when compared with the advantages.

Antitoxin itself is generally regarded as quite harmless, and the above toxic effects are stated to be the result of by-products which contaminate. The rare effect, local abscess, will be best avoided by a strict attention to the cleanliness of the needle and syringe.

Diphtheria antitoxin is also used as a prophylactic to protect against infection. The value of this proceeding, though clearly established for animals, experimentally, is more difficult to test clinically. It would seem, however, that the protection, if conferred, lasts but a short time, probably not more than a few weeks,[2] and therefore its use will be limited to times of especial exposure to infection. The dose required to protect is, as we should expect it to be, much smaller than that needful to overcome the developed disease. Behring proposed 60 to 160 units for this purpose. Heubner in sixty-four cases (children) began with 150 units and later used 200 units; he saw no ill-effects from the process, and recommends it to meet the danger of an epidemic. We must wait further evidence upon this use of antitoxin.

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[1] The Metropolitan Asylums Board Report on the use of diphtheria antitoxin in 1896 confirms and strengthens the conclusions arrived at in their Report for 1895. On the value of early injection the Report says: "A dose of 2,000 units will usually secure a result on the first day which 50,000 will not effect on the fourth." An increase in the complications, especially albuminuria and paralysis is noted, but little importance is attached to this. The Report is signed by all the superintendents except one.

[2] Heubner, Behandlung der Diphtherie, 1895.

Glanders.—The toxins which are produced in cultures of the glanders bacillus have been separated, and, in concentration, as a glycerine extract, are known as malleïn; the active substances have also been obtained in a dry form. Malleïn is useful diagnostically to detect the presence of the infection of glanders in horses; it has been said to be capable also of conferring immunity on certain animals, and of curing the developed disease, and it has even been employed in man in the treatment of chronic glanders, but this latter application is too unworked to afford data of any value.[1]

Bonome following Babes has administered malleïn in the treatment of chronic glanders in man with good results, *i.e.*, improvement. He injected two or three drops on several occasions, and subsequently continued the injections of $\frac{1}{20}-\frac{1}{15}$ c.c., about a drop or a little under, at intervals of two or three days. This treatment was followed in a couple of months by marked improvement, local and general. Glandered horses treated on the same lines improve. (Sims Woodhead, Allbutt's *System of Medicine*, 1897.)

Anthrax (malignant pustule, Woolsorters' disease).—Though much work has been done in respect of the attenuation of the anthrax bacillus, and in the way of protective inoculations of sheep and cattle, according to the method of Pasteur, there is at present no serum therapy available for the treatment of the developed disease in man. Local and general methods of treatment remain therefore unchanged.

Asiatic Cholera.—The specific organism of this disease, a spirillum, of which there appear to be several pathogenic varieties, is not found in the blood, and the symptoms which it causes are due to the absorption of tox-albumins, or of toxins mixed with albuminous substances, which are elaborated in the alimentary tract by the spirilla.

Many experiments prove that susceptible animals may receive immunity by the injection of small doses of attenuated cultures of the specific organism, or by injecting larger quantities of sterilized cultures; in the latter case the protection must be conveyed by some antitoxin. It would seem that *specific* differences exist between the several *varieties* of the cholera organism, so far as the conveyance of immunity is concerned, a culture protective against one variety proving ineffectual against another.

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[1] Cf. Sternberg, *Immunity and Serum Therapy*, pp. 174–181.

In Spain, in 1885, during the epidemic of cholera then prevailing, Dr. Ferrán inoculated human beings on a large scale with pure cultures of the comma bacillus in bouillon. Each person received 1 c.c. in each arm, and after five days re-inoculations were in many cases performed. The adverse report of the French Commission on Dr. Ferrán's practice seems to have been too hasty and summary, and, according to Shakespeare's Report to the U.S. Government, authentic official statistics collected after the visit of the French Commission point strongly to the value of Ferrán's method.

More recently M. Haffkine has devised a method of vaccination, which has been extensively tried in India with very satisfactory results.

Everything points to the view that the serum of animals which have acquired immunity contains a substance which could be used *curatively*, but the method for obtaining this still waits.

As Sternberg points out, protective inoculations are not likely to take place upon any large scale, because preventive measures properly carried out are in themselves very efficient.[1]

Small-pox.—Of protection against this disease by vaccination, a method which has stood the test of time, we need say nothing. It superseded an older method by inoculation. No antitoxin has been isolated from the blood of immune animals, *e.g.*, calves which have been vaccinated, and are therefore protected, or from the blood of patients who have passed through an attack of small-pox, but the researches of Sternberg and of Kinyon are very strongly suggestive of the presence of an antitoxin. The use of the serum of immune animals as a curative agent in attacks of small-pox has been tried on a limited scale, but without definite results.

Hydrophobia.—A micro-organism is suspected in this disease, but has not yet been demonstrated. By various methods the poison of rabies may be attenuated and so modified that, when inoculated into animals, it will confer protection against the disease without itself producing symptoms. The material inoculated is an emulsion of the spinal cord of a rabid animal; in general the rabbit is selected. By keeping in a dry atmosphere the virulence of such spinal cord becomes more and more attenuated. Inoculations of this same material on human beings who have been bitten by rabid animals have been practised on a very extensive scale at the various Pasteur institutes. The method of inoculation is that known as "intensive"; it consists in the giving of a series of injections, beginning with a virus of much attenuation and ending with a strong virus. The statistics of the above-named institutes claim a reduction in the mortality to under 1 per cent. among those who have been bitten by an animal proved to be rabid.

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[1] Sternberg, *Immunity and Serum Therapy*, 1896. Consult this authority for the above statements.

From experiments upon animals, it would appear that intravenous injections of the virus will answer just as well as the ordinary inoculations. Tizzoni and Centanni have developed a serum therapy, using the blood serum of animals rendered immune; they hold that their method will be found applicable at any time during the period of incubation, even "up to the moment of the appearance of symptoms of rabies." According to Sternberg (whom consult in reference to the above), the authors are engaged in preparing an antitoxin.

It is right perhaps to add that the Pasteur treatment of rabies has been very much discussed and combated; as Osler puts it, "there is still much discussion as to the full value of this method."

Tetanus.—This disease has been treated by the injection of an antitoxin, but the evidence as to its value is at present very conflicting. The reasons for this perplexity may be thus stated (*see* Kanthack):—(1) The difficulty in determining the mortality of the natural disease; this mortality has been estimated variously by different authorities—at from 80 to 90 per cent. according to some, and 21 per cent. according to others.

(2) The known difference in the mortality which obtains, according as the disease develops rapidly or not; in general the shorter the incubation period the more fatal the disease. The difficulty stated in No. 1 results, Kanthack says, from the carelessness observed in respect of the separation of acute from chronic cases.

(3) It seems further doubtful, according to a statement by Albertoni, whether the statistics of certain southern observers may be trusted, *i.e.*, whether some of the cases of unsuccessful antitoxin treatment were not suppressed.

Kanthack concludes that the serum treatment does not seem to have changed the prognosis in acute and serious cases, though in the milder cases it has appeared to lessen the spasms, the pain, and the distress.

The serum most in use is that of Tizzoni and Cattani, which may be obtained from Merck in the dry state, but Behring also prepares an antitoxin. Kanthack quotes the total statistics of treatment at 68 cases, with 26 deaths, *i.e.*, a percentage mortality of 38·23 per cent.

Modern practice recommends a large dosage to the extent even of 100 c.c. of the serum; the largest dose to be injected at one spot should not exceed 25 c.c. This 100 c.c. would represent a maximum initial dose, subsequent dosage to depend upon symptoms and results.

Osler sets the dosage at 20 to 30 c.c. of the fluid serum for the first dose, 15 to 20 c.c. every 5 or 10 hours after, according to need. Tizzoni, he says, advises 2·25 grammes of his dry antitoxin as a first dose and 0·6 gramme for subsequent doses. As stated, the tendency is to raise the dosage even to 100 c.c. of the fluid serum.

Tetanus antitoxic serum may be obtained from the Institute of Preventive Medicine.

Snake poison.—We owe to Professor Calmette, of Lille, the discovery and development of a serum treatment for this form of poisoning. At the Pasteur institute of Lille, under his directions, the "sérum antivenimeux" is prepared from horses which have been rendered immune to the venom of serpents. Calmette's experiments with this serum prove incontestably its power to protect animals against the bites of serpents, and its power to antagonize the effects of the poison when injected after infection. The latter power may be exhibited and prove successful even when the animal is near death. In this country Prof. Fraser has confirmed Calmette's results. The serum has been used in a certain number of cases on man and with excellent results. Calmette quotes eight such cases,[1] in all of which the nature of the snake bite was accurately determined by the capture of the animal, or by other evidence considered to be indisputable. His conclusions are thus set down:[2]—

The treatment of poisonous snake bite should consist in the use of hypodermic injections of the antivenomous serum; of this a dose of 10 c.c. will suffice in most cases, but in severe cases or in those receiving belated treatment it may be necessary to inject two or three such doses at once; the ordinary precautions, aseptic, are to be adopted, as in all other cases of hypodermic injections. Should the symptoms be very urgent, and death threaten, the injection is to be made directly into some superficial vein; the antivenomous serum is efficacious against the bites of all kinds of venomous serpents, also against the bites of scorpions; the use of the serum does not contraindicate any of the precautions to be adopted for the prevention of absorption of the poison from, or its destruction in, the wound, and therefore a ligature should always be placed on the limb above the bite, and, in every case, the bite should be carefully washed, either with a solution of chromic acid, 1 per cent., or better still with a fresh made solution of hypochlorite of lime in boiled water, 1 in 60. There is no use in cauterizations of the wound, a good antiseptic dressing being all that is required for local treatment; frictions of the surface may be used to rouse the patient, but nervine stimulants, such as coffee and alcohol, are harmful rather than useful.

The treatment of animals, bitten by serpents, is, of course, on the same lines.

Streptococcus infection.—In the pyogenic affections so-called, under which we find classed puerperal fever, erysipelas, certain acute abscesses, etc., a streptococcus is present. A number of experiments have been made on the subject of this infection, and it has been found possible to render animals immune to this microbe, and to develop in the serum of such animals during immunization an antitoxic power. In man the application of anti-streptococcus serum to the treatment of disease has been made in this country by Messrs. Ballance and Abbott[1] in a case of hæmorrhagic septicæmia; by Dr. Coleman and Mr. T. G. Wakeling[2] in another case of septicæmia; by one of ourselves,[3] most successfully, in a case of malignant endocarditis, in two other cases of the same disease the malady was not overcome, though in one the serum seemed temporarily to act beneficially. Dr. A. E. W. Fox, of Bath,[4] reports a case of malignant endocarditis treated by the serum, which, though not successful in averting death, seemed to ameliorate the symptoms and to encourage to further trial. In scarlet fever of septic type Dr. Knyvett Gordon[5] reports a case which appeared to react most successfully to the use of the serum, and he makes the suggestion that this treatment may prove valuable in any case of scarlet fever which takes on a septic character, whether or not a septic condition of the throat exist, which is sufficient, apparently, to account for the poisoned blood state.

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[1] *Annales de l'Institut Pasteur*, March, 1897.

[2] *Op. cit.*, pp. 236, 237.

The possibilities of the utilization of this serum are great, seeing the wide range of septicæmic conditions and the tendency which so many forms of disease show to take on a septic character. In the case of ulcerative endocarditis, as is well known, various forms of micro-organisms have been found in the endocardial lesions, the most common being streptococci and staphylococci, and in the successful case of this disease above quoted streptococci were found in the blood. Here then was a septic blood state, such as has characterized the several cases above mentioned and the other scattered cases of disease which have been treated by anti-streptococcic serum. Septicæmic symptoms will be the indication generally for its use, but we should in every case endeavour to discover the nature of the organisms in any existing local lesion, as well as the presence of such in the blood itself. According to some authorities it is only streptococcic infection which yields to this serum, but it is probably too early yet to accept this statement without reserve, and, indeed, some observations of Emmerich (*cf.* Sternberg) indicate that the serum of streptococcic septicæmia in rabbits has a restraining influence over anthrax infection in the same animals.

Of more practical importance is the question of dosage: this, for the present, will have to be more or less tentative in each case, and it will have to vary with the urgency of the symptoms in each individual case. We would suggest that in any severe case it will be well to begin with not less than 20 c.c. of the serum as a first dose, and to follow this by doses of 10 c.c. every day or every other day till some distinct impression is made upon the disease. We shall, of course, be on the look-out for any adverse local or general symptoms which may be attributable to the serum itself and must be guided by any such as they arise, but in our own case of ulcerative endocarditis on only one occasion out of 6 injections did any local signs (pain) arise or any general symptoms (rise of temperature); both of these reactions were very transient. The dose of 20 c.c. above mentioned was of serum provided by the British Institute of Preventive Medicine, and it was given to a boy of 13 years, it could probably, therefore, be exceeded considerably in the case of an adult; it would however be best in the case of adults with symptoms of urgency to keep the first dose at 20 c.c., and to repeat this dose, or give 10 c.c., according to the needs of the case at an interval of 12 hours and so forth. In this way the procedure will be more under control. In Dr. Knyvett Gordon's case of scarlet fever 10 c.c. of the "sérum anti-streptococcique" of the Institut Pasteur were injected into a boy of 6 years of age; this dose was repeated on the following day; no more injections were required. Mr. Lenthal Cheatle[1] has recorded the results of the anti-streptococcic serum in four cases of acute infection, two of which he regarded as pure streptococcic infections and two as mixed infections; local surgical and antiseptic measures were also adopted. Mr. Cheatle's results are not at all conclusive in favour of the serum, but, as he points out, the disease was well advanced in all the cases before the serum was resorted to. His cases, however, are interesting from the point of view of dosage, for he advanced this so that 30 c.c., 35 c.c., and in one case 75 c.c. were given at a dose, without any evidence of bad symptoms, local or general, attributable to the serum.[2]

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[1] *Brit. Med. Journ.*, July 4, 1896. [2] *Brit. Med. Journ.*, Sept. 12, 1896.
[3] *Lancet*, Oct. 17, 1896. [4] *Lancet*, Feb. 20, 1897. [5] *Lancet*, Jan. 2, 18

In Ballance and Abbott's case the serum of the Institut Pasteur was employed (Marmorek's serum), and as the result of watching their case they suggested that, in a similar case, 20 c.c. should be given at first and then 7 c.c. every 4 hours. Not a few isolated reports of the use of Marmorek's serum are to be found in Continental literature. Consult Merck's Report for 1896 (March, 1897). It would appear from the statements of Aronson and other authorities that the anti-streptococcic serum as yet obtainable is neither very permanent nor of well-defined strength; moreover, it is not quite certain whether there may not be more than one kind of streptococcus. The dosage hence which we have recommended must be regarded as tentative and provisional.

Typhoid Fever.—According to Osler[3] dead cultures of typhoid bacilli grown in thymus bouillon have been used by E. Fränkel in the treatment of the disease. He injects 0·5 c.c. of such cultures, deeply, into the muscular tissue of the lateral gluteal region; on the following day 1 c.c. is injected, and then an injection is made every second day, the dose being *increased* each time by 1 c.c. Chills may follow the first or second injection. In the sequence a more remittent type of fever is established, defervescence may be anticipated and sometimes the fall occurs by crisis. In fifty-seven cases treated on these lines good results were obtained.

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[1] *Lancet*, Jan. 2, 1897.

[2] This was obtained from the British Institute of Preventive Medicine.

[3] *Practice of Medicine*, 2nd edit., 1895.

Rumpf has used cultures of the bacillus pyocyaneus, prepared in the same way, with good results also, losing only 2 patients out of 30[1]; as Dreschfeld remarks, this does not look like a specific treatment as yet, seeing that different organisms prove equally effective.

Attempts have also been made (*see* Osler) to treat typhoid patients by the use of serum derived from patients convalescent from typhoid.

Pneumonia.—The researches of the observers, G. and F. Klemperer, which point to the development by the micrococcus of pneumonia of a special poison, pneumotoxin, which in the tissues causes, by a reactive process, the development of its antagonist, an anti-pneumotoxin—these researches seem to furnish a basis for a serum therapy, but no real advance has been made in this direction, though it is said that the serum of patients recovering from an attack of pneumonia has been injected into animals suffering from the disease, with curative effects. The same treatment has been tried in a few cases on man also, and it is said, with good results.[2] According to Sternberg,[3] G. and F. Klemperer tried the effects of the serum of rabbits, which they had rendered immune to the Micrococcus pneumoniæ, upon 6 cases of pneumonia in man; in each case a notable fall in the temperature followed the injection. Foà and Scabia were less successful with this serum in 10 cases of pneumonia in man.

Tubercle.—The treatment of tubercle by injections of tuberculin or of modifications of this has been practically abandoned, but not the hope that on these or similar lines some agent may be found which may be able to confer immunity against the attacks of the bacillus of tubercle, and may act curatively upon those who have become infected. Quite recently Koch is advancing a modification of his original tuberculin as able to confer immunity upon animals, and to cause retrogression of the tuberculous foci in those that have been infected. This modification is prepared from dried cultures of bacilli which have been broken up by pulverization in an agate mortar. An emulsion of this pulverization is made with water and the solid particles separated from the liquid by centrifuge action. The liquid so obtained has properties very like the old tuberculin, but from the sediment it is possible to extract again, and by repeating the former process, centrifugalizing, another agent is obtained which acts as above stated, and which differs from the old tuberculin in not causing any or but slight febrile reaction when injected; we must await results.

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[1] Osler, *loc. cit.*; *see* also Allbutt's *Medicine*, vol. i., article on "Typhoid" by Dreschfeld. [2] *See* Osler. [3] *Immunity and Serum Therapy.*

The fluid obtained by centrifuging the first emulsion of pulverized bacilli is labelled by Koch T. O. (obere Schicht); that which is obtained from the *deposit* of the first centrifuge action, after drying this deposit, repulverizing in an agate mortar, re-emulsionizing and again separating by the centrifuge, that and all subsequent fluids obtained by a repetition of the process, Koch names T. R.

He uses very small doses to begin with (employing a fluid which contains in each cubic centimetre 10 millegrammes of solid residue),[1] in order to avoid local or general reaction; gradually he increases the dose till even 20 millegrammes are employed, *i.e.*, 2 c.c. He injects every second day.

His fluids can be obtained from Meister Lucius and Bruening, Höchst-am-Main. For injection purposes the fluid may be diluted with physiological saline solution, but not with any carbolized fluid.

If in the course of the injections the body temperature rises, we must stop further injections till the temperature has become normal.

He records remarkable results in lupus, but naturally he warns against the application of this to cases of phthisis in the last stages, when the tissues are irreparably damaged. He also states that the fluid will be useless against streptococcus infection if that is complicating the tuberculous process. In suitable cases the patients gain in weight and show great improvement in the temperature curves.[2]

Passing to the group of animal extracts, the use of which may be termed isopathic, we find a long list, thus, we have thyroid and suprarenal extracts, extract of pituitary body, and extracts of various other organs and tissues, or else the dried and powdered substance of these same, viz., the lymphatic glands, the spleen, the thymus, the red bone-marrow, the ovary, the testicle and prostate, the liver, the kidneys, the brain.

Some of these remedies have attained a considerable reputation, others are comparatively untried. The most important is, perhaps, the *thyroid extract*, which has its chief use in the treatment of myxœdema and cretinism, but has also been employed in other affections.

In both myxœdema and cretinism the symptoms present are held to be due to absence of the thyroid, or to deficiency of the same, and the rational treatment has been shown to be the supply of fresh thyroid,

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[1] $\frac{1}{500}$ millegramme of solid residue is the initial dose, *i.e.*, 0·1 c.c. is diluted five hundred times with salt solution, and of this dilution 0·1 c.c. is injected. Full instructions are issued with the phials of the new tuberculin sent out by Lucius and Bruening. For further particulars, consult Koch's paper, "Ueber Neue Tuberkulin Präparate," *Deutsche Med. Wochenschr.*, April 1, 1897. Koch thinks there is no likelihood of improvement upon these preparations.

[2] *Medical Press and Circular*, April 21, 1897.

›f thyroid extract. The thyroid of the sheep is generally chosen,
that of the pig or cow may be employed if more easily obtained.
)r. George R. Murray writes[1] as follows:—the thyroid gland may
given raw in doses varying from $\frac{1}{8}$th of a lobe up to a whole lobe;
larger doses are apt to occasion gastro-intestinal disturbance and
er toxic symptoms. The portion of the gland should be minced
l taken in glycerine, or some other vehicle, to cover the raw taste, or
gland may be lightly cooked by frying before it is eaten (the
ninistration of thyroid by the mouth we owe to Dr. Hector Mac-
ızie and Dr. E. L. Fox). Or we may use a glycerine extract,
ained from the whole gland (both lobes); some 6 c.c. of active
ract being the yield. Dr. Murray describes[2] the method of pre-
ing this extract, of which the dose will be ♏iij.–xx., ordered in
form of the undiluted drops; or the dried and powdered thyroid
nd may be given either as a powder or in tabloid or pill.

Che best means of regulating the dosage is to keep a watchful eye
on the symptoms, for in this remedy we have a very powerful agent,
l some fatal cases from incautious dosage are recorded. Dr. Murray
s on to describe the symptoms which should guide us:—the pulse
uld be carefully noted, any undue acceleration, amounting to 10
20 additional beats per minute, being taken to indicate that the
e given is quite large enough; upon any acceleration in excess of
s the dose must be diminished. A rise of temperature is another
lication, and should this amount to one degree above the normal, the
e must be considered too large and must be decreased. Again,
uld gastro-intestinal disturbance arise, it must be treated and the
e lowered. During the early stage the patient should be confined
bed, for syncopal attacks may else occur, and even prove dangerous.
. Murray refers to a case of death within twenty-four hours from
taking of $\frac{1}{4}$ of a lobe of a sheep's gland. He seems rather to favour
use of the glycerine extract above referred to, of which he gives
minims at the start, advancing thence to 10 or 15 minims, these as
gle doses, administered once each day at, say, two or three hours
er breakfast. It may be necessary, he says, to give the full dose,
minims, twice daily.[3]

Che treatment by hypodermic injection is now rarely employed, see-
that the drug is given quite efficaciously by the mouth. Should
be adopted, however, all precautions as to asepticity must be ob-
ved, and a syringe of Koch's pattern, or one with asbestos plunger,
ployed. The hypodermic dose should be, of the glycerine extract,
15 minims, twice or thrice weekly, during the first stage of treat-

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[1] *Twentieth Century Practice of Medicine*, vol. iv., p. 742.

[2] *Ibid.*, p. 740.

[3] Other extracts are made with glycerine and given in varying dose (*see*
tra Pharmacopœia); the important point in every case, however, is to
in with a minimal dose and advance according to the symptoms.

ment. After the first stage has passed, *i.e.*, after the more acute symptoms of reaction due to the drug have passed off and the patient seems to have gained a maximum of effect, then will come the second stage of treatment which will consist in the maintenance of this effect. For this second stage the dosage, according to Murray, will lie between 5 and 15 minims daily, a single daily dose being preferable, in his experience, to larger doses at longer intervals. In very hot weather a smaller dose is required than in cold weather. The patient should be kept in touch with and seen some three or four times during the year.

Osler puts the dose of the powdered gland during the first stage of treatment at 1 grain of the powdered gland thrice daily, increasing the dose gradually up to 10 or 15 grains per diem.

Heinsheimer (*die Schilddrüsen Behandlung*, 1895) cites among the list of symptoms which may be regarded as toxic, irritation of the skin, restlessness, rapid pulse, delirium, and, in rare cases, tonic spasms.

Two or three cases with old heart lesion have died during or after the treatment. Osler cites a case in which a temporary condition of Graves' disease was induced.

Whichever preparation of thyroid is selected, we must again insist on the importance of beginning with small doses, which may be increased gradually. Single dosage, daily, answers every purpose. Next we would insist on the importance, during the second stage, of maintaining the cure by the continuous employment of the drug in small dose every day, or every other day. Thyroid gland has been employed in the treatment of Graves' disease, which affection is held by many to result from a perverted internal secretion of the gland; thus far, however, the results are not on the whole encouraging, though some have reported well of this employment. Dr. G. R. Murray[1] says of it, that it has been occasionally used with advantage, but that it has in some cases seriously aggravated the symptoms, and that therefore it must be used with caution.

In cretinism and dwarf-growth, thyroid has been used with great success. G. R. Murray states that it can be given in relatively larger dose than in myxœdema, and that even cases of long standing can be treated from the beginning without confinement to bed, there being little, if any, liability to syncope during treatment. He cautions, however, that unusual exertion should not be permitted during the first stage of treatment.

As to dose, he says, that even to a small cretin, 1–3 minims of the glycerine extract may be given each day, at the outset—and that then the dose may be increased up to 5 or 7 minims, or even more daily, if required. With continuance more or less tolerance is established, and the dose may need to be increased. If the dose be too large, it will be shown by the raised pulse and temperature, the pains, restlessness, purging, etc. When the cretinous symptoms have been overcome, the drug will still be needed to favour and maintain growth, and this second stage of treatment must be life-long. A dose each day, or every other day, or twice weekly, will be needed, and naturally the smaller the efficient dose the better.

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[1] Twentieth Century Practice of *Medicine*, vol. iv.

The best success is obtained with early cases.

Thyroid treatment has proved useful in the treatment of obesity.

It has been employed with some success in a variety of skin affections, viz., pityriasis rubra, ichthyosis, lupus, also in eczema, and in some cases of psoriasis. In the latter affection it has been much extolled, but quite a number of authorities are now discarding its use, on account of the depression produced by the large doses required to produce an effect and the uncertainty and instability of the result. (*Dublin Journal of Medical Science*, Nov. 2, 1896, Dr. Purdon.)

In the thyroid gland two new substances have been discovered, viz., iodo-thyrine and thyroid-antitoxin. The discovery of the presence of iodine in organic combination in the thyroid is of great interest; the iodine combination is known as iodo-thyrine, and, already, experiments with it are said to have given good results in myxœdema, and in skin diseases, also in obesity. In myxœdema the dosage recommended is grains 5–8, daily, for adults, the dose being gradually increased even up to 32 grains and more.[1]

Thyroid-antitoxin is not albuminoid, but "probably a derivative of guanidine."[2] Its therapeutic value is not established.

For the present we shall do best therapeutically by employing the powdered gland or its extracts. Merck states that the powdered gland does not keep very well.

Thymus.—This gland has been employed in exophthalmic goitre with encouraging results. In one case (Owen's) the disease was of twenty years' standing, and yet was much benefited; the patient, a man, received one lobe of the cervical portion of the thymus, three or four times a week. In another case, that of Mikulicz, the patient, a woman, received 10 grammes of finely-minced sheep's thymus thrice weekly; the dose was further increased gradually up to 25 grammes.[3]

Further encouraging reports have been received from several observers;[4] the doses found effective by these latter were from 2·5–5 grammes (40–80 grains) of *dry* thymus.

The thymus glands in use are obtained from calves and sheep. From the substance of the gland iodine has been obtained, this probably exists in the gland in a state of combination similar to iodothyrine, the iodine compound of the thyroid gland.

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[1] Merck's Annual Report for 1896 (March, 1897).

[2] Cf. Merck, *op. cit.*

[3] G. R. Murray, *op. cit.*

[4] *See* Merck's Report for 1896 (published March, 1897).

Dr. Hector Mackenzie (*American Journal of Medical Science*, Feb., 1897) comes to the conclusion that thymus gland has no specific curative value in Graves' disease. His results are based on 15 cases collected and 20 cases of his own. Mackenzie holds that, if given, the dosage should be not less than 1 to 2 drachms of the fresh gland or its equivalent, daily.

Suprarenal Bodies.[1]—The internal secretion of these glands is now considered to serve an important purpose in the metabolism of the body generally, and the disease known as Addison's is now regarded as due to inadequacy of this gland as a secreting organ. Thus the pathology of Addison's disease is brought into line with the modern pathology of myxœdema. It is, however, not yet determined whether the suprarenal secretion antagonizes certain toxic principles which the tissues tend to develop, and so prevents an auto-intoxication, or whether the adrenal supplies a something which has a positive beneficial action; on the former theory the disease (Addison's) would be of the nature of a toxæmia, on the latter view, it would be more comparable to an anæmia.

Numerous experiments upon the physiology of the suprarenal glands have been made; among the most recent are those of Oliver and Schäfer, who, working with suprarenal extracts have found that, on injecting these into animals, the blood-pressure rises greatly, the rise being due chiefly to constriction of the arterioles resulting from a direct peripheral action upon the small arteries, and not to a central action transmitted to the periphery by the nerves. On the heart the action of the extract is inhibitory, the beats becoming feeble and slow. On the muscles a veratria-like effect is produced, the period of relaxation being greatly prolonged. The active principle of the suprarenal gland appears to reside only in the medulla.

The application of the knowledge recently gained on the subject of these glands is first to cases of Addison's disease. Dr. G. Oliver in two cases obtained results which were encouraging, during a three months' treatment. Dr. Rolleston also reports well of the treatment in one case, but Dr. Chauffard, Dr. T. Oliver, and Sir T. Grainger Stewart were unsuccessful with it. Drs. Ringer and Phear[2] contribute an unsuccessful case, but they refer to cases of improvement, under the treatment, recorded by Dr. Lloyd Jones, Dr. Sansom, and Dr. Stockton. Dr. Rolleston urges the importance of dose, and that 45 grains of the original gland "spread over the twenty-four hours is certainly not too much," and accordingly, even if we start at a lower level, the dose should be raised to, and maintained at, not less than 45 grains per diem. In the case of Drs. Ringer and Phear, the dose was started at the equivalent of 45 grains per diem, and gradually raised till, in fourteen days, the equivalent of 120 grains of gland was administered daily.

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[1] In the statements on this subject we are largely indebted to Dr. Rolleston's Goulstonian Lectures for 1895.

[2] Clinical Society's Transactions, 1896.

This treatment may be regarded as on its trial.

We have seen that suprarenal extract injected into animals raises the blood-pressure by contracting the arterioles; so great is this contraction that the use of the extract as a hæmostatic has been suggested. According to Merck, the preparation has been found by Dor to have a hæmostatic action in capillary hæmorrhage. A specially prepared extract, supplied by Merck under the name Extractum suprarenale hæmostaticum siccatum, causes marked blanching of the surface when applied to the conjunctiva; this is strikingly demonstrable if the conjunctiva is congested or inflamed. The eye is otherwise uninfluenced—no effect on pupil or accommodation.

The action of suprarenal extract upon the vascular system being the reverse of that of thyroid extract, Dr. G. Oliver has suggested its use in exophthalmic goitre.

Oliver and Schäfer have found that artificial gastric digestion has no influence upon the suprarenal extract, therefore it is correctly given by the mouth.[1] Neusser,[2] who states that in Addison's disease the suprarenal extract treatment has failed, or given temporary results only, is of opinion that this may be the result of the ready disintegration which the active principle of the glands tends to undergo.

Red Bone-Marrow.—It is well known that in pernicious anæmia the bone marrow is liable to undergo a change, the tendency being towards an increase of the red or blood-forming marrow. This change, though it may be absent in a majority of cases, is sometimes pronounced, and it has been regarded as of the nature of a compensatory action to meet the spoiling of the red-blood cells which is taking place elsewhere. On this theory it has been proposed to administer the red marrow obtained from the bones of oxen in the disease pernicious anæmia. In 1894 Fraser[3] reported striking results from the use of three ounces, daily, of uncooked red marrow obtained from the ribs or from the cancellous ends of the long bones. This was in a case of pernicious anæmia, but unfortunately salol was also given simultaneously, in dose of 15 – 30 grains, daily. According to Merck[4] positive results were also obtained by Barrs, Drummond, and J. S. Billings; the former of these, Barrs, curing a serious case of pernicious anæmia which arsenic had actually made worse! Combe obtained good results in 10 cases of chlorosis (rapid improvement), in 4 cases of rickets, and in 2 cases of severe pseudo-leukæmia in infants.[5] Less favourable results were obtained by Hunt,[1] who, in his comparison of the relative values of bone marrow and of arsenic, concludes in favour of arsenic. Hunt employed the red bone-marrow obtained by splitting ox ribs longitudinally, scooping out the soft cancellous bone, pounding in a mortar with a little water and straining off the bone spicules with muslin; he used the equivalent of 2 ounces of marrow each 24 hours.

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[1] Cf. Rolleston, *op. cit.*

[2] *The Suprarenal Bodies*, etc., Vienna, 1897.

[3] *Brit. Med. Jour.*, June 2, 1894.

[4] Annual Report for 1895 (published March, 1896).

[5] Merck, *loc. cit.* *See* also the Report for 1896 (published March, 1897).

The treatment is worthy trial. If the raw bone marrow be employed the above dosage should be administered; the marrow may be given in sandwich form with plenty of salt and pepper and any desirable flavouring, such as lemon juice, etc., or it may be added to a strong and highly seasoned beef-tea which is at a temperature fit for drinking. It must not be cooked with the beef tea.

There is also available a glycerine extract, the dose of which is one-half to one drachm, and tabloids or their equivalent of dried red marrow—the dose of the dried marrow is 5 to 30 grains. It will be well to push this treatment to the limits of tolerance before discarding it; we should therefore work with the higher range of doses, and not hesitate to overstep the limits here assigned if there be no symptoms to contra-indicate.

Almost every gland or tissue of the body has been requisitioned by this modern organo-therapy, and either the dried gland itself or an extract is for the most part obtainable. In procuring these we should always see that we obtain the preparations from a firm of repute. We may briefly enumerate the following:—

Pituitary Body (*Hypophysis Cerebri*).—Of this gland, obtained from the ox, an extract, or the dried gland in powder or tablet, has been administered in acromegaly. The treatment is under trial, but as yet the results have not been at all striking. In Rolleston's case 5-grain tabloids, thrice daily, gave no result. Marinesco and Mendel speak of improvement under this treatment (Merck's Report, published 1896). Iodine has been discovered in the gland.

The dried *Prostate* gland has been administered either in the fresh state or dried, as a powder, in hypertrophy of the prostate (Merck's Reports, 1896, 1897). Data at present are insufficient for any conclusion.

Ovary.—The gland dried and powdered has been administered in pill or tablet in the treatment of the ill-defined group of symptoms which are observed at the climacteric, *i.e.*, at a period when the ovarian function is ceasing, and when therefore any influence by internal secretion which the gland may effect upon the system is being withdrawn. The first successful results obtained by Mond have been confirmed by several observers abroad, the symptoms of sympathetic disturbance of this period yielding to the drug. This is a reasonable case of isopathy, and further trial is warranted. Chlorosis, which is so frequently found along with menstrual disorders, has also yielded, it is said, to this treatment (consult Merck, 1897). The dose of the dried preparation (Merck's) is 8 - 16 grains, *i.e.*, 2 or 3 of his tabloids three times daily. He gives a formula for pills which are flavoured with vanilla and coated with chocolate; they are of the same strength as the tabloids.

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[1] Lancet, Feb. 1, 1896.

Orchitic Substance.—Either the dried gland or an extract, the older form of administration, is made use of in conditions of nerve debility. Since this treatment was proposed by Brown Séquard it cannot be said to have gained ground. Its employment is not irrational, but its value is certainly not established. Tabloids, the equivalent of 5 grains of the fresh substance, may be obtained, or Merck's preparation of the dried and powdered gland, or the Liquor testicularis, dose 15 minims up to a drachm.

In the gland an organic ferment, spermine, has been discovered by Poehl, and by him the value of the gland preparations is attributed to this body, spermine. Spermine is supplied in capsules containing 1 c.c. (16 minims) of a 2 per cent. solution, this is the dose for one injection hypodermically. The injection is generally made daily at first; after 10 or 12 injections the interval may be extended. There is also an essence of spermine for administration by the mouth, dose, 20 - 30 minims.

Spermine has been advocated in neurasthenia; it is supposed to act upon the tissues generally by stimulating oxidation.

Doubtless the circumstance and pomp of a hypodermic injection will have its own value in neurotic cases—a value not wholly to be despised.[1]

Piperazine.—We may here make mention of a body, built up synthetically, a base intended to replace spermine, but which subsequent investigations have shown to be quite different from spermine—we allude to piperazine, also known as piperazidine and as dispermine.

Piperazine has been found to possess great solvent powers over uric acid, and the drug is in use at present, for this purpose, in uric acid states, gout, gravel, and stone, including cases of renal colic.

Piperazine can be obtained in tabular crystals, which, however, are very hygroscopic and tend therefore to liquefy. It is readily soluble in water, the solution is nearly tasteless.

The dosage is 15 grains daily; the administration may be in the form of the granular effervescent piperazine, each drachm of which contains 5 grains; or of tablets, each containing 15 grains (the day's dose), there is also an effervescent piperazine water, containing 5 grains in the tumblerful. Piperazine may well be tried in conditions which would indicate lithium salts.

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[1] On Spermine consult Merck's Report, published 1894.

We must leave unnoticed the therapeutics of dried kidney, dried liver, dried spleen, or of liquid extracts from these same; of extracts of pancreas, extract of heart; of extract obtained from the brain or spinal cord, etc. Of these all and of other tissues and organs, *e.g.*, salivary glands, mammary glands, synovial membranes, etc., preparations are available or about to become so. For our purpose they are insufficiently developed. For notice of them consult Martindale's *Extra Pharmacopœia* and Merck's Annual Reports.

As already stated, this entire group of the physiological animal extracts owes its origin to the recognition of the importance of the internal secretion of the organs and tissues, severally, to the proper working of the organism as a whole. From this study something important and practical has come already, doubtless also many unreasonable anticipations; there is ample room for work original and critical. Before finally leaving this subject we may refer to the results of castration upon the hypertrophied prostate (causing it to diminish in size), and the exceedingly interesting work of Beatson followed up by Stanley Boyd amongst others, upon the effect of removing the ovaries in cases of inoperable cancer (this operation having been followed in certain cases by retrogression of the cancer). These results point to an influence exerted by glands, an influence perhaps to be explained again as instances of "internal secretion" influence, and they indicate that this influence may on occasion be with advantage withdrawn—a new therapeutic departure!

It is early days to speculate here, but we may perhaps venture this that, as there is an equilibrium in health, so there is one in disease, but a different one, and that an organ which, in the healthy state of itself and of the body generally, is a balancing force, may in disease turn the scale against the economy.

DIETARY FOR INVALIDS

SOME receipts for preparing foods suitable to the invalid state will now be given, but we may with advantage, perhaps, discuss very briefly one or two points before so doing.

First, many diseases, *e.g.*, the whole group of the digestive disorders, the chronic rheumatic affections, diabetes mellitus (perhaps to be classed as a digestive disorder), obesity (the fatty tendency), etc., are intimately and obviously connected with the food problem, and dieting accordingly is the first requisite. But, indeed, the order of consideration, in each and every case of disease, is first diet, then medicine, and we shall be less likely to fail in this the essential order of treatment if we keep constantly in mind that upon the proper alimentation of the individual the vital processes depend alone, and that never under any circumstances can this position be claimed for medicines. The moment it can be shown that a medicine so-called is in any degree a force yielder or a tissue former, in that very moment and to that same degree the medicine steps out of the rank of medicines, proper, and takes position as a food.

Drugs, and medicines generally, are to be regarded rather as stimuli or as conditioning influences, and as such they may fulfil purposes of the highest importance. They may promote assimilation, they may by calling upon the reserve store of available forces locked up in the tissues tide the organism through a crisis, but always their function will be subordinate to that of supplying the organism with the means of replenishing itself with force (dynamic and potential) and the materials for the repair of the tissues.

Perhaps fewer silly things will be said about medicines if this position is always clear in the mind of the prescriber.

Next we may draw attention to the fact that the point to aim at in health, is to put a sufficient interval between the several meals—which by the by should not be more than three in number—and that this sufficient interval is not less than 4½ to 5 hours. Long ago Dr. Paris insisted upon this, and urged the mischievousness of not allowing the organs of digestion the rest which they, like every other organ of the body, demand.

Whilst, however, this is the condition which we have to aim at in our endeavour to complete the restoration to health, we may, during the course of disease, find it necessary to act upon the principle of "little and often."

Again, whilst in the healthy state the organs of digestion find their health in the digestion of simple, well-cooked foods, the effort requisite for this act of digestion being a valuable stimulus to them, in disease we may have to reduce this effort to a minimum, and supply a food as nearly as possible ready for absorption. We shall, however, in the return towards health gradually withdraw these aids to digestion in our striving to restore general and local vigour. Thus beginning, in states of feeble digestion, at the bottom of the scale, we shall have recourse to milk or some modification of milk, to meat broths, in fact to slop diet; thence we shall proceed, first thickening the milk or the broth with some well-cooked farinaceous or mucilaginous constituent, and very gradually mounting up the scale—lightly-boiled eggs, white fish, chicken, following each other in order, till we reach the diet of health.

We should here note that in diet, as in other matters, idiosyncrasy makes itself felt, and that a difficulty in the digestion of one particular article of diet or in a whole class of foods may exist. This holds very markedly for the starchy group and an amylaceous dyspepsia is prominent amongst forms of dyspepsia and is very often found among the dwellers in towns, and those who lead an insufficiently active life, physically. In obesity again, a trouble likely to arise among the same class of people, it has been found that it is the starchy aliment which must be chiefly credited with this perversion. In diabetes—the acute variety—starch and sugar may be almost said to be active poisons, and yet again in the large class of chronic rheumatisms and in gout the some aliments require to be carefully restricted. On all these counts the withdrawal of the amylaceous and saccharine foods in greater or less degree is advocated by many as a means of cure or of prevention. Hence several well-known diets:—Banting's, Oertel's, Ebstein's;[1] hence also a form of dietary, which constitutes an extreme—Dr. J. H. Salisbury's.

To this last we may give a few words: The diet is used curatively and after a certain period, in modified form, is maintained more or less permanently. In the first stage the diet is restricted practically to meat and hot water. The muscle pulp of beef is most recommended, and this made into cakes is broiled and then seasoned with butter, pepper, and salt: the use of certain sauces, of mustard, horse-radish, or lemon juice is permitted. A little celery as a relish is allowed. This constitutes the meal—there may be an occasional change to broiled mutton—and it is repeated three times daily. Nothing is drunk at the meal, but at about one and a half or sometimes two hours before the next meal half a pint to a pint of hot water at a temperature of from 110 to 150° Fah. (*i.e.*, at about the temperature of one's hot tea or coffee), is sipped—15 to 30 minutes being taken over the drinking of the water. Should the water nauseate, Dr. Salisbury recommends that a little salt should be sprinkled in, or a small quantity of clear tea or coffee, or half a teaspoonful of aromatic spirits of ammonia. He gives as the best times for the hot water, 6 a.m., 11 a.m., 4 p.m., and 9 p.m., before retiring. The duration of the treatment will depend very much upon the nature of the trouble, and upon the mode of reaction to the diet. The hot water part is recommended to be continued for months or even for years. The exclusive meat diet—half a pound to a pound, or even more, is taken at each meal—may be continued for some 2 to 6 weeks, and then gradually the choice of vegetables may be increased and some thoroughly cooked bread foods, such as baked chip-bread, thin dry toast, rice, etc., introduced. Before this, or along with it, it will have been allowable to extend the scale of meats, as follows, broiled mutton and lamb, broiled game, broiled chicken, broiled codfish, broiled and baked fish free from fat, a soft boiled egg, etc.

Subsequently, health being restored, it is recommended to keep the starchy foods well in the background, the albuminate being the most prominent. Dr. Salisbury[1] treats a number of affections on these lines, with various modifications of detail. The above is the sample diet, the essential being the temporary complete exclusion of all starches and sugars, and the potation of hot water at 1 to 2 hours before each meal, and at about ½ hour before going to rest.

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[1] For these consult Burney Yeo's Food in *Health and Disease.*

Resting before and after the meal is advocated.

This diet does undoubtedly cure, and sometimes quickly, various forms of dyspepsia, certain gouty and rheumatic cases, and it should not be forgotten in such cases if they prove rebellious to the more usual means. It will need careful supervision, especially in the weakly. It will be necessary to remember that even upon this spare diet it is possible to over-eat, and that the quantities of one or sometimes even two pounds of meat which are taken at a meal may be harmfully excessive.

In obesity this treatment pursued for a few weeks will often prove most effectual, whilst at the same time the well-being of the patient is preserved. Dr. W. Towers Smith used to give a course of 9 weeks of such treatment in obesity, maintaining for 2 weeks a rigorous diet, with an increased supply of hot water, viz., six pints to a gallon in all; during the next 3 weeks the water was reduced to four pints and a little green vegetable and unsweetened rusk introduced, also a selection from several kinds of lean meat; during the next 4 weeks, the hot water was further reduced to a quart a day, and stale crusts and Captain's Biscuits admitted, and hock or claret with seltzer water allowed.[2]

DIRECTIONS FOR COOKING THE BEEFCAKES[3] (according to Dr. Salisbury's plan):—

"Take four ounces of the beef pulp, which has been nicely minced, as before directed, and freed from all connective tissue and fat, etc.; season with black pepper and salt, but add no liquid. With two forks form it nicely and quickly into flat round cakes from ½ – 1 inch thick, and broil them slowly and moderately well, over a clear but not a fierce fire, turning the griller every minute. They will take from six to eight minutes. If pressed hard and tight in the making, they are livery, not nice, and very indigestible. A small piece of fresh butter may be put on each cake when done; serve on a *piping hot* plate."

We may remember that Dr. Salisbury allows certain sauces, Worcester or Halford's, also mustard, horse-radish, lemon juice—a selection from these.

Mrs. Stuart, a very strong advocate of the system as a result of experience in her own case and that of others on a large scale, gives a receipt for preparing beef heart as a cheaper yet excellent substitute for the beef: consult her book. She also gives directions for a mince which she highly recommends. It is as follows:—

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[1] *The Relation of Alimentation and Disease.*

[2] *See* Yeo, *op. cit.*, p. 490, 1st edition. Also Whitla, *Dictionary of Treatment.*

[3] From *What Must I Do to Get Well?* by Mrs Elma Stuart, 1895.

"A thick steak from the top side of the round, quite fresh. Remove all skin and fat, cut the meat required into strips, and scrape away with a sharp knife as much of the connective tissue as possible. Run the meat three times through the mincer ('Enterprise' Mincer, No. 5). If after a few minutes it does not pass freely, unscrew the ring, take out the knives and clear them of the connective tissue; replace them and set to work again. The pulp should be put in the saucepan with salt and black pepper, and cold water or well skimmed gravy in the proportion of a full dessert-spoonful to each ounce of the pulp. (If the meat is specially dry, add a little more liquid.) Beat it all well together to a thick cream.

"The saucepan must now be put on a cool part of the stove or range, and the pulp warmed through very gradually, and very slowly cooked, being briskly stirred and beaten up with a wooden spoon the whole time. It should never get too hot to the touch while cooking (temperature about 115° Fah.). If gradually and gently cooked so, it takes from 20 to 30 minutes according to quantity, and should, when finished, be as soft and smooth as it was before being put on the stove, with no taste or smell of rawness. It must never be left on the stove to cook itself or to 'keep hot,' but should be turned out at once, when done, into a hot bowl and covered. If properly cooked, it is delicious like a thick, smooth cream, without any lumps or granules."

GENERAL RECEIPTS FOR INVALID COOKERY

1. *Barley Soup.*

One pound of shin of beef, four ounces of pearl barley, one potato, salt and pepper to taste, one quart and a half of water.

Put all the ingredients into a pan, and simmer gently for four hours. Strain, return the barley, and heat up as much as required.

2. *Bread Soup.*

One pound of bread, two ounces of butter, one quart of stock.

Boil the bread with the butter in stock. Beat the whole with a spoon or fork, and keep it boiling till the bread and stock are thoroughly mixed. Strain, season, and serve.

3. *Tapioca Soup.*

Two ounces and a half of tapioca, one quart of stock.

Put the tapioca into cold stock, and bring it gradually to the boiling point. Simmer gently till tender, and serve.

4. *Sardinian Soup.*

Two eggs, a quarter of a pint of cream, one ounce of fresh butter, salt and pepper to taste, a little flour to thicken.

Beat the eggs, put them into a stewpan, and add the cream, butter, and seasoning, stir in as much flour as will bring it to the consistency of dough, make it into balls the size and shape of a nut, fry in butter, and put them into a basin of any sort of soup or broth, to which they make a very nice addition.

5. *Restorative Beef Essence* (i.)

Take one pound of fresh beef, free from fat, chop it up fine, and pour over it eight ounces of soft water, add five or six drops of hydrochloric acid, and fifty or sixty grains of common salt, stir it well, and leave it for three hours in a cool place. Then pass the fluid through a hair sieve, pressing the meat slightly, and adding gradually towards the end of the straining about two more ounces of water. The liquid thus obtained is of a red colour, possessing the taste of soup. It should be taken cold, a teacupful at a time. If preferred warm, it must not be put on the fire, but heated in a covered vessel placed in hot water.

Should it be undesirable for the patient to take the acid, this soup may be made by merely soaking the minced beef in distilled water.

6. *Another Beef Essence* (ii.)

Take one pound of gravy beef, free from fat and skin, chop it up very fine, add a little salt, and put it into an earthen jar with a lid, fasten up the edges with a thick paste, such as is used for roasting venison in, and place the jar in the oven for three or four hours. Strain through a coarse sieve, and give the patient two or three teaspoonfuls at a time.

7. *Beef Essence* (iii.)

Cut up in small pieces one pound of lean beef from the sirloin or rump, and put it in a covered saucepan, with half a pint of cold water; place by the side of the fire for four or five hours, then allow it to simmer gently for two hours: skim well, and serve.

8. *Beef Tea.*

Two pounds of beef without fat or bone, a pint of cold water, place in a jar in a saucepan of water. Simmer four hours.

9. *Mutton Jelly.*

Six shanks of mutton, three pints of water, pepper and salt to taste, half a pound of lean beef, a crust of bread toasted brown.

Soak the shanks in water several hours, and scrub them well. Put the shanks, the beef, and other ingredients into a saucepan with the water, and simmer very gently for five hours. Strain, and when cold take off the fat. Warm up as much as is wanted at a time.

10. *Beef Tea with Oatmeal.*

Mix two tablespoonfuls of oatmeal very smooth with two spoonfuls of cold water, then add a pint of strong boiling beef tea. Boil together for five or six minutes, stirring well all the time. Strain through a sieve and serve.

11. *Baked Soup.*

One pound of lean beef, one ounce of rice, pepper and salt to taste, one pint and a half of water.

Cut up the meat into slices, add the rice and seasoning, place all in a jar with the water, cover closely, and bake for four hours. Pearl barley may be substituted for rice if preferred.

12. *Mutton Broth.*

Two or three pounds of neck of mutton, two pints of water, pepper and salt, half a pound of potatoes or some pearl barley.

Put the mutton into a stewpan, pour the water over it, pepper and salt. When it boils skim carefully, cover the pan, and let simmer gently for an hour. Strain, let the broth get cold, and then remove all the fat. When required for use add some pearl barley or potatoes in the following manner:—Boil the potatoes, mash them very smoothly so that no lumps remain; put the potatoes into a pan, and gradually add the mutton broth, stirring till it is well mixed and smooth. Let simmer for five minutes, and serve with fried bread.

13. *Soup.*

Take three or four pared potatoes, a thick slice of bread, half a teacupful of pearl barley or rice, a little salt and pepper, two quarts of beef tea or mutton broth. Heat the beef tea or broth in a pan, and when quite boiling add the rest of the ingredients, except the pepper and salt, which should be added when nearly done; cover the pan, and let boil slowly for an hour. Serve with toasted bread.

14. *Rabbit Soup.*

Soak a rabbit in warm water, and when quite clean cut it in pieces, and put it into a stewpan with a teacupful of veal stock or broth, simmer slowly till done through, then add a quart of water, and boil for an hour. Then take out the rabbit, pick the meat from the bones, covering it up to keep it white; put the bones back into the liquor, and simmer for two hours; skim, strain, and let cool. Pound up the meat in a mortar with the yolks of two hard-boiled eggs and the crumb of a French roll, previously soaked in milk; rub through a tammy, and gradually add the strained liquor, and simmer for fifteen minutes. If liked *thick* mix some arrowroot with half a pint of new milk, bring it to the boil, mix with the soup, and serve. If preferred thin have ready some pearl barley or vermicelli boiled in milk and add either to the soup instead of the arrowroot. Serve with little squares of toast or fried bread.

15. *Calf's Foot Broth.*

One calf's foot, three pints of water, one small lump of sugar, the yolk of one egg.

Stew the foot in water *very gently*, till the liquor is reduced to half, remove the scum, set it in a basin till quite cold, then take off every particle of fat. Warm up about half a pint, adding the sugar, taking it off the fire for a minute or two; then add the beaten yolk of the egg. Keep stirring it over the fire till the mixture thickens, *but do not let it boil*, or it will be spoiled.

16. *Veal Soup.*

A knuckle of veal, two cow-heels, twelve peppercorns, a glass of sherry, and three pints of water.

Stew all the ingredients in an earthen jar for six hours. Do not open till cold. When wanted for use, skim off the fat and strain. Heat as much as is required for use.

17. *Good Stock for Soup.*

One pound of shin of beef, one pound of knuckle of veal, four white peppercorns, a lump of sugar, one quart of water.

Simmer gently for six hours, skim well, and strain.

18. *Nourishing Soup.*

Stew two ounces of the best well-washed pearl sago in a pint of water till quite tender and very thick, then mix with half a pint of good, boiling cream and the yolks of two fresh eggs. Blend the whole carefully with one quart of essence of beef, made according to number 7. The beef essence must be heated separately, and mixed while both mixtures are hot. A little of this may be warmed up at a time.

19. *Sago Soup.*

An ounce and a half of sago, one pint of stock.

Wash the sago, put one pint of stock on the fire, and bring it to the boil; add the sago, and simmer till it is entirely dissolved. When cold it will form a jelly.

20. *Rice Soup.*

Three ounces of Patna rice, the yolks of two eggs, half a pint of cream or new milk, one quart of stock.

Boil the rice in the stock, and rub half of it through a tammy, put the stock in a stewpan, add the rest of the rice whole, and simmer gently for five minutes. Have ready the cream or milk, boiled. Beat the yolk of the eggs, and mix them gradually with the cream. Take the soup off the fire, add the cream and eggs, stirring them well together as you mix them. Heat up gradually, but *do not let boil*, or the eggs will curdle and the soup be spoilt.

21. *Semolina Soup.*

Drop an ounce of semolina into one pint of boiling stock, and stir constantly to prevent burning. Simmer gently for half an hour, season with salt to taste.

22. *Raw Meat Diet.*

Two ounces of rump steak, taking away all fat, are to be cut into small squares, without entirely separating the meat, place in a mortar and pound for five or ten minutes, then add three or four tablespoonfuls of water, and pound again for a short time; now take away all sinew or fibre of the meat, leaving only the creamy substance; add salt to taste. Before using, place the cup or jar containing the pounded meat in hot water until just warm.

Another way:—Scrape the beefsteak with a sharp knife and after removing all the fat and tendon, if not already in [illegible] tar. This may be taken in the form of with salt and pepper to taste, or it may be mixed with water to the consistence of cream.

This diet is excellent for children with diarrhœa, also for adults who suffer from irritable bowels or chronic diarrhœa.

Or, thirdly, scrape and pound the meat with cold water to the consistence of thin cream and then allow to stand, and pour off the supernatant fluid, leaving the sediment behind.

Raw meat may be made more palatable by pouring over it a little warm gravy—not too warm—or by adding some strong and well-seasoned beef tea made in the usual way.

In cases of wasting, anæmia, and prostration, it is said that the fresh blood of animals—such as fowls—mixed with warm wine, or milk punch, warm lemonade, milk or coffee, and taken immediately, or before coagulation, is very useful.

It relieves prostration, as in cases of flooding, restores warmth and circulation, and acts better and more promptly, it is said, than transfusion from vein to vein. The blood of two or three chickens should be taken in the twenty-four hours.

Another raw meat preparation:—Take half a pound of lean rump steak, scrape with a knife until all the pulp is removed from it, then add as much sugar as will be needed to sweeten, according to taste; break the lumps of sugar with the meat in a basin with a small wooden spoon. Add gradually as much milk as will make the pulp of the thickness of arrowroot, flavour with brandy. Strain through a gravy strainer if there is any fibre of the meat left, for the mixture should be perfectly smooth.

23. *Peptonized Beef Tea.*

Half a pound of finely minced lean beef is mixed with a pint of water and 20 grains of bicarbonate of soda. This is simmered for an hour. When it has cooled down to a lukewarm temperature, a tablespoonful of the liquor pancreaticus (Bruger) is added. The mixture is then set aside for three hours and occasionally stirred. At the end of this time the liquid portions are decanted and boiled for a few seconds. It may be seasoned with salt (Sir W. Roberts).

This beef tea is rich in peptone, and is about equivalent to milk in nutritive value.

24. *Peptonized Beef Jelly.*

Proceed as above, but *after* the final boiling add the requisite amount of gelatin or isinglass to the hot peptonized liquid, and let the liquid cool and set (Roberts).

25. *Peptonized Milk (prepared hot).*

A pint of milk is diluted with a quarter of a pint of water, and heated to a temperature of about 140° Fah. (60° C.). Two teaspoonfuls of liquor pancreaticus, together with 20 grains of bicarbonate of soda, are then mixed therewith. The mixture is then poured into a covered jug, and the jug is placed in a warm situation in order to keep up the heat. At the end of an hour or an hour and a half the product is raised to the boiling point. It can then be used like ordinary milk (Roberts).

26. *Peptonized Milk (prepared cold).*

A pint of milk is diluted with half a pint of lime-water, or with half a pint of water containing 20 grains of bicarbonate of soda in solution. To this are added three teaspoonfuls of liquor pancreaticus. The mixture is then set aside at the ordinary temperature of the dwelling room, 60° Fah., for a period of three or four hours, and is now ready for use (Roberts).

(If kept longer the process would continue, and the milk become too bitter, unless the ferment be destroyed by boiling the liquid at this stage.)

27. *Peptonized Gruel.*

Any one of the farinaceous gruels may be made in the usual way. The gruel should be thick and strong. Pour into a covered jug; let cool till lukewarm, and then add two teaspoonfuls of liquor pancreaticus for every pint of gruel. At the end of three hours boil and strain (Roberts).

28. *Peptonized Milk Gruel.*

Make in the usual way a good thick gruel of any farinaceous article; at once, while still hot, add an equal quantity of cold milk. At the temperature which results add two teaspoonfuls of liquor pancreaticus and 20 grains of bicarbonate of soda for each pint of the mixed gruel and milk. Set aside for two or three hours in a warm place, finally raise to the boiling point and strain (Roberts).

Sir William Roberts has obtained the most satisfactory results with this preparation.

29. *Peptonized Enemata.*

Peptonized milk gruel or peptonized beef tea may be prepared in the usual way up to the point of the addition of the liquor pancreaticus. This may be added, when the liquid has cooled down sufficiently, in the dose of one dessert-spoonful, and the fluid then at once injected into the bowel, there to become peptonized (Roberts).

Or, more simply, we may complete the peptonizing outside the body, and inject the peptonized milk gruel or beef tea.

If the injection be given very slowly, taking a quarter of an hour or twenty minutes over the procedure, a bulky nutritive enema may be given and retained—half a pint, or even a pint. (*See* Enemata.)

30. *Bread Jelly.*

Take the crumb of a loaf, break it up, pour boiling water over it, and leave it to soak for three hours. Then strain off and add fresh water, place the mixture on the fire, and let it boil till it is perfectly smooth. Take it out, and after pressing out the water, flavour with anything agreeable. Put it into a mould, and turn it out when required for use.

31. *Milk Porridge.*

Put a quart of milk into an enamel-lined saucepan. When on the point of boiling scatter in by degrees half a pound of coarse oatmeal; stir until the mixture thickens. When thickened let it continue to boil about twenty minutes. The porridge can be made thick or thin accordir
be eaten as it is, or with the addition of salt, sugar, tre

32. *Oatmeal Porridge. Whole-meal Bread.*

Oatmeal three or four ounces. Water one pint. Boil the water and add a little salt, about one-sixteenth of an ounce. Sprinkle in the meal very gradually and carefully, till of a sufficient consistency. Stir it well all the time with a porridge stick (which should be an inch broad at the bottom). Boil gently for fifteen or twenty minutes, add a little more boiling water, and boil it five minutes longer, which makes it smooth. Pour it on plates and serve. The usual way is to make a hole in the middle with a spoon, add a piece of butter the size of a nutmeg, and upon it a spoonful of coarse brown sugar, eat it from the circumference, and dip each spoonful into the butter and sugar.

Whole-meal bread is often useful in habitual constipation, especially of children.

33. *Macaroni.*

Two ounces of macaroni, a quarter of a pint of milk, a quarter of a pint of good beef gravy, the yolk of one egg, two tablespoonfuls of cream, half an ounce of butter. Wash the macaroni, and boil it in the gravy and milk till *quite* tender. Drain it, put the macaroni into a very hot dish, and place it by the fire. Beat the yolk of the egg with the cream and two tablespoonfuls of the liquor the macaroni was boiled in. Make this sufficiently hot to thicken, ***but do not allow it to boil***, or it will be spoiled; pour it over the macaroni, and strew over the whole a little finely grated Parmesan cheese; or the macaroni may be served as an accompaniment to minced beef without the cheese; or it may be taken alone, with some good gravy in a tureen served with it.

34. *Macaroni Boiled in Milk.*

One ounce of macaroni, three-quarters of a pint of new milk, a little lemon-rind, a little white sugar.

Put the milk into a saucepan with the lemon-rind, bring it to boiling point, and drop in the macaroni. Let it swell gradually over the fire till *quite* tender, but do not allow the pipes to break.

35. *Rice Milk.*

Three tablespoonfuls of rice, one quart of milk.

Wash the rice, put it into a saucepan with the milk, and simmer gently till the rice is tender, stirring it now and then to prevent the milk burning. Sweeten a little, and serve with a cut lemon, black currant jam, or apples stewed.

36. *Rice Cream* (i.).

To a pint of new milk add a quarter of a pound of ground rice, a lump of butter the size of a walnut, a little lemon-peel, and a tablespoonful of powdered sugar. Boil them together for five minutes, then add half an ounce of isinglass which has been dissolved, and let the mixture cool. When cool add half a pint of good cream whisked to a froth, mix all together, and set it for a time in a very cool place, or on ice. When used, turn it out of the basin into a dish, and pour fruit juice round it, or some stewed apple or pear may be served with it.

37. *Rice Cream* (ii.).

A quarter of a pound of whole rice, well stewed in milk, and put in a sieve to drain and cool. Mix with the rice a gill of good cream whisked to a froth, and add a wine-glass of sherry, a little powdered sugar, and a teaspoonful of lemon-juice.

38. *Light Pudding.*

Boil very smoothly in new milk one tablespoonful of ground rice, let it get *quite cold*, then add two eggs, very well beaten up, a lump of white sugar, and, if liked, a dessert-spoonful of brandy. Line a small tart-dish (sufficient for one person) with paste, put in the pudding, and bake quickly. Serve the moment it is ready, for it falls directly.

39. *Semolina Pudding.*

One ounce of semolina, half a pint of milk, one ounce of butter, two eggs, sugar to taste.

Heat the milk and mix it with the semolina, sugar and butter; stir this over the fire for a few minutes, then take it off and mix with it the eggs, which should be well beaten. Butter a small tart-dish, line it with puff paste, put in the pudding, and bake in a slow oven.

40. *Rice Pudding.*

One ounce of whole rice, three-quarters of a pint of milk, half an ounce of butter, one egg, sugar to taste.

Let the rice swell in the milk over a slow fire, stir in the butter, and then let the mixture cool Well beat the egg and mix with the rice, butter a breakfast cup or small mould, fill it three parts full, and bake. Turn it out and serve.

41. *Tapioca Pudding.*

One ounce of tapioca, one pint of milk, one ounce of butter, one egg, sugar to taste.

Wash the tapioca, and let it stew gently in the milk for a quarter of an hour, stirring it now and then. Let it cool, mix with it the butter, sugar and eggs, which must be well beaten. Put into a small tart-dish and bake in a moderate oven.

42. *Vermicelli Pudding.*

Two ounces of vermicelli, three-quarters of a pint of milk, quarter of a pint of cream, one ounce and a half of butter, two eggs, one ounce and a half of sugar.

Boil the vermicelli in the milk till it is tender, then stir in the remaining ingredients. Butter a small tart-dish, line with puff paste, put in the pudding and bake.

43. *Milk Blancmange.*

A quarter of a pound of loaf sugar, one quart of milk, one ounce of isinglass.

Put all the ingredients into a lined saucepan, and boil gently till the isinglass is dissolved. Keep stirring over the fire for about ten minutes, strain through a fine sieve into a jug, and when nearly cold pour into an oiled mould. Turn out carefully when required for use.

44. *Rice Blancmange.*

A quarter of a pound of ground rice, two ounces of loaf sugar, one ounce of butter, one quart of milk, flavouring of lemon-peel.

Mix the rice to a smooth batter with a little milk, and put the remainder of the milk into a saucepan with the butter, sugar and lemon-peel. Bring the milk to boiling point, stir in the rice. Let boil for ten minutes, or till the rice milk comes away from the saucepan. Grease a mould with salad oil, pour in the rice, let it get perfectly cold, and turn out.

45. *Arrowroot Blancmange.*

Two tablespoonfuls of arrowroot, three-quarters of a pint of milk, lemon and sugar to taste.

Mix the arrowroot with a little milk to a smooth paste, put the rest of the milk on the fire, and let boil. Stir in the arrowroot, sweeten and flavour, stirring all the time, till the milk thickens sufficiently to come from the saucepan. Put it into a mould till quite cold.

46. *Baked Bread Pudding.*

Half a pint of new milk, a quarter of a pound of bread crumbs, two eggs, one ounce of butter, sugar to taste.

Boil the milk and pour it over the bread crumbs, and let them soak for half an hour. Beat the eggs, mix them with the bread crumbs, and the sugar and butter, and stir well till thoroughly mixed. Butter a breakfast cup, or small pudding mould, fill it a little more than half full with the mixture, and bake in a moderate oven for about twenty minutes.

47. *Baked Custard Pudding.*

Warm half a pint of milk, or a little more, whisk two eggs, yolks and whites, add the milk to them, stirring all the while. Have ready a small tart-dish, lined at the edges with paste. Pour the custard into the dish, grate a little nutmeg over the top, and bake it in a very slow oven for half an hour.

48. *Boiled Custard Pudding.*

Prepare the custard as in the foregoing receipt. Butter a small basin that will exactly hold it, put in the custard, and tie a floured cloth over it; plunge the whole into boiling water, and float it about for a few minutes; boil slowly for half an hour, turn out and serve.

49. *Rice and Apple.*

Boil about two tablespoonfuls of rice in a pint and a half of new milk, and simmer, stirring it from time to time till the rice is quite tender. Have ready some apples, peeled, cored, and stewed to pulp, and sweetened with a very little loaf sugar. Put the rice round a plate, and the apple in the middle and serve.

50. *Apple and Rice.*

Peel and halve three small apples, take out the cores, put the halves into a stewpan with about half an ounce of butter, and strew over them a little white sifted sugar. Stew them very gently till tender, taking care not to break them. Boil the rice with milk and a little sugar till quite soft, and when done, dish it with the apples on the top of it, and a little cream served with it separately.

51. *Fruit Cream.*

Apples, gooseberries, rhubarb, or any fresh fruit.

Prepare the fruit as for stewing, put it into a jar with two tablespoonfuls of water and a little good moist sugar. Set this jar in a saucepan of boiling water, and let it boil till the fruit is soft enough to mash. When cooked enough beat it to a pulp, work this pulp through a colander, and to every pint stir in a pint of milk or cream. Of course the cream is best, if obtainable. Sweeten and serve.

52. *Minced Fowl and Egg.*

Cold roast fowl, a hard-boiled egg, salt, pepper or cayenne to taste; three tablespoonfuls of new milk or cream, half an ounce of butter, one tablespoonful of flour, a tea-spoonful of lemon juice.

Mince the fowl, and remove all skin and bones; put the bones, skin and trimmings into a stewpan, with one small onion if agreeable, and nearly half a pint of water; let this stew for an hour, then strain the liquor, chop the egg small, mix with the fowl, and add salt and pepper, put in the gravy and other ingredients, let the whole just boil, and serve with sippets of toasted bread.

53. *Fowl and Rice.*

A quarter of a pound of rice, one pint of stock or broth, one ounce and a half of butter, minced fowl, egg and bread crumbs.

Put the rice into the cold stock or broth, let it boil very gently for half an hour, then add the butter, and simmer till it is quite dry and soft. When cold make into balls, hollow out the inside and fill them with mince made according to the foregoing receipt, but a little stiffer; cover with rice, dip the balls into egg, sprinkle with bread crumbs, and fry a nice brown; a little cream stirred into the rice before it cools improves it very much.

54. *Chicken and Rice.*

Cut up the meat of boiled chicken, have ready some rice well cooked and seasoned with salt, put round a small flat dish or vegetable dish, warm up the chicken in a little good gravy, and serve in the middle of the dish with the rice round it.

55. *Panada.*

Take the crumb of a penny roll and soak it in milk for half an hour, then squeeze the milk from it; have ready an equal quantity of chicken or veal, *scraped* very fine with a knife; pound the bread crumbs and meat together in a mortar. The pulp may be cooked either mixed with veal or chicken broth, or it may be poached like an egg, by taking it up with two spoons in pieces of the shape of an egg; after seasoning, it should be served on mashed potato.

56. *Oysters.*

Take half a dozen native oysters, and put them into a saucepan (after they have been well washed in cold water). Put in a lump of butter the size of a walnut, a little salt and pepper, put the saucepan on the fire for ten minutes, *not more*, taking it off now and then and stirring it. Then add a few drops of lemon-juice or vinegar.

57. *Stewed Oysters.*

Half a pint of oysters, half an ounce of butter, flour, one-third of a pint of cream, cayenne and salt to taste.

Scald the oysters in their own liquor, take them out, beard them, and strain the liquor. Put the butter into a stewpan, dredge in sufficient flour to dry it up, add the oyster liquor, and stir it over a sharp fire with a wooden spoon. When it boils add the cream, oysters and seasoning, and simmer for one or two minutes, but *not longer*, or the oysters will harden, serve on a hot dish with croûtons or toasted sippets of bread. A quarter of a pint of oysters, the other ingredients being in proportion, make a dish large enough for one person.

58. *Lobster.*

Take a small claw of a lobster or crab, and put on it a little salt, a quarter of a teaspoonful of salad oil, and a drop or two of vinegar. This is digestible even for delicate stomachs.

59. *Demulcent Drink.*

Take a pinch of isinglass, and boil it in half a pint of new milk, with half a dozen bruised sweet almonds and three lumps of sugar.

60. *Milk and Cinnamon Drink.*

Boil in one pint of new milk sufficient cinnamon to flavour it pleasantly, and sweeten with white sugar. This may be taken cold with a teaspoonful of brandy, and is very good in cases of diarrhœa. Children may take it milk-warm without the brandy.

61. *Milk and Isinglass.*

Dissolve a little isinglass in water, mix it well with half a pint of milk then boil, and serve with or without sugar as preferred.

62. *Milk, Rum, and Isinglass.*

Dissolve in a little hot water over the fire a pinch of the best isinglass; let it cool, and mix a dessert-spoonful of rum with it in a tumbler, and fill up the glass with new milk.

63. *Sherry or Brandy and Milk.*

To one tablespoonful of brandy, or one wine-glassful of sherry, in a bowl or cup, add powdered sugar and a very little nutmeg to taste. Warm a breakfast-cupful of new milk, and pour it into a spouted jug; pour the contents from a height over the wine, sugar, etc. *The milk must not boil.*

64. *Milk, Egg, and Brandy.*

Scald some new milk, *but do not let it boil.* It ought to be put into a jug, and the jug should stand in boiling water. When the surface looks filmy it is sufficiently done and should be put away in a cool place in the same vessel. When quite cold beat up a fresh egg with a fork in a tumbler, with a lump of sugar. Beat quite to a froth, add a dessert-spoonful of brandy, and fill up the tumbler with the scalded milk.

65. *Egg and Wine.*

One egg, half a glass of cold water, one glass of sherry, sugar, and a very little grated nutmeg.

Beat the egg to a froth with a tablespoonful of cold water. Make the wine and water hot, *but not boiling*; pour it on the egg, stirring all the time. Add sufficient sugar to sweeten, and a very little nutmeg. Put all into a lined saucepan on a gentle fire, and stir it *one way* till it thickens, *but do not let it boil.* Serve in a glass with crisp biscuits, or sippets of toast.

66. *Egg and Sherry.*

Beat up an egg with a fork till it froths, add a lump of sugar and two tablespoonfuls of water; mix well, pour in a wine-glassful of sherry, and serve before it gets flat. Half the quantity of brandy may be used instead of sherry.

67. *Caudle.*

Beat up an egg to a froth, add a wine-glassful of sherry and half a pint of gruel, flavour with lemon-peel and nutmeg, and sweeten to taste.

68. *Another Caudle.*

Mix well together one pint of cold gruel with a wine-glassful of good cream, add a wine-glassful of sherry, and a tablespoonful of noyau, and sweeten with sugar-candy.

69. *Egg and Brandy.*

Beat up three eggs to a froth in four ounces of cold spring water, add two or three lumps of sugar, and pour in four ounces of brandy, stirring all the time. A portion of this may be given at a time.

70. *Egg, Rum, and Lemon.*

Six new-laid eggs (with shells), the juice of seven lemons; macerate until the shells are dissolved. Then beat up together with a pint of the oldest Jamaica rum, strain through muslin, and add a quarter of a pound of sugar-candy. The eggs should all be laid the same day. Give a teaspoonful at a time.

71. *White Wine Whey.*

To half a pint of boiling milk add one or two wine-glassfuls of sherry strain through a fine sieve, sweeten with sifted sugar and serve.

72. *Mulled Wine.*

Boil some spices, cloves, nutmeg, cinnamon or mace, in a little water, just to flavour the wine; then add a wine-glass of sherry, or any other wine, and some sugar, bring it to boiling point, and serve with sippets of toast. If claret is used, it will require more sugar. The vessel for boiling the wine should be scrupulously clean.

73. *Port Wine Jelly.*

Put into a jar one pint of port wine, one ounce of gum arabic, one ounce of isinglass, two ounces of powdered white sugar-candy, a small piece of cinnamon. Let this stand closely covered all night. The next day put the jar into boiling water and let it simmer till all is dissolved, then strain it, let it stand till cold, and then cut it up into small pieces for use.

Another receipt. One pint of port wine, one ounce of isinglass, one ounce of sugar, a quarter of a pint of water.

Put the isinglass and sugar into a quarter of a pint of water. Set it over the fire till the isinglass is dissolved, then add the wine. Strain it through a jelly bag or a clean piece of muslin into a jar or mould, and let it set. It is best to cover till cold.

74. *Arrowroot Drink.*

Mix two teaspoonfuls of arrowroot in about three tablespoonfuls of cold water, then pour in half a pint of boiling water; when well mixed, add by degrees half a pint of cold water, stirring all the time, so as to make it perfectly smooth; it should be about the consistence of cream; if too thick a little more water may be added. Then pour in two wine-glassfuls of sherry or one of brandy, add sugar to taste, and give it to the patient in a tumbler A lump of ice may be added if allowed.

75. *Barley Water.*

To a tablespoonful of pearl barley, washed in cold water, add two or three lumps of sugar, the rind of a lemon, and the juice of half a lemon. On these pour a quart of boiling water, and let the mixture stand for seven or eight hours. Strain it. The barley should never be used a second time. Half an ounce of isinglass may be boiled in the water.

76. *Linseed Tea.*

Two tablespoonfuls of linseed, one pint of water, half a lemon, sugar to taste, a piece of liquorice the size of a nut. Boil an hour and a half.

77. *Nutritious Coffee.*

Dissolve a little isinglass in water, then put half an ounce of freshly ground coffee into a saucepan with one pint of new milk, which should be nearly boiling before the coffee is added, then boil together for three minutes; clear it by pouring some of it into a cup and dashing it back again, add the isinglass, and leave the mixture to settle on the hob for a few minutes. Beat up an egg in a breakfast-cup, and pour the coffee upon it; if preferred, drink it without the egg.

78. *To Keep Milk from Turning Sour.*

Fifteen grains of bicarbonate of soda to a quart of milk hinders it turning sour.

79. *Sour Milk Diet.*

The milk for this food must be good. It must be allowed to stand for forty-eight hours in a cool cellar; the vessel in which it is kept being upright, as a gallon measure. The milk becomes solid, and looks like poor blancmange. It carries a cream on the top, which most people remove, as it makes it too rich. To about a pint of this sour milk, or rather less, add half a pound of grated rye-bread, a good deal of powdered sugar, and a glass of sweet milk, well stirred together.—*Hints to the Sick.*

80. *Butter Milk.*

Boil a spoonful of flour for a few minutes in a pint of butter-milk, and add half a drachm of sugar. This is good for infants with irritable stomach and intestines.

Another diet for children with delicate stomachs who cannot be suckled is the following:—Boil a teaspoonful of oatmeal or barley in from three to six ounces of water for a quarter of an hour. Equal parts of this should be added to skimmed milk.

In the case of children suffering from diarrhœa, and who pass curdy stools, it is useful to cut off all forms of milk—even mother's milk. Some doctors advise giving cream with barley water, but in my experience this food generally disagrees. Indeed, I generally find it necessary in all forms of children's diarrhœa to forbid milk, and to give instead barley water and veal broth, or chicken broth, or, best of all, Nestlé's Food, which I find the best of all food for children with great delicacy of the stomach and intestines. Thin gruel is often well borne, and, like barley water, may be added to chicken broth or veal broth.

81. *Koumiss; Kefir.*

These are preparations of fermented milk of the utmost value at times in cases of mal-nutrition associated with irritability of stomach—thus in phthisis. They are to be obtained from the leading milk companies.

82. *Junket.*

To a pint of milk, heated till it is lukewarm, add a teaspoonful of concentrated essence of rennet, and a small teaspoonful of pounded white sugar. Pour it into a bowl or mould, cover with a napkin, put it aside to cool, when it is ready for use.

Concentrated essence of rennet can be bought at all grocers.

83. *Lemonade* (i.).

Well rub two or three lumps of sugar on the rind of a lemon, squeeze out the juice, and add to it half a pint or a pint of cold or iced water, or, better still, a bottle of soda-water.

84. *Effervescing Lemonade* (ii.).

Squeeze two large lemons, and add a pint of spring water to the juice, and three or four lumps of white sugar. When required for use pour half of it into a tumbler, and add half a small teaspoonful of carbonate of soda; stir and drink whilst effervescing.

85. *Lemonade* (iii.).

The juice of four lemons, the rinds of two, half a pint of sherry, four eggs, six ounces of loaf sugar, one pint and a half of boiling water.

Pare the lemon rind thinly, put it into a jug with the sugar, and pour the boiling water on it. Let it cool, and then strain it and add the wine, lemon-juice, and eggs, previously well beaten and strained. Mix all well and it is ready for use.

86. *Lemonade* (iv.).

Pare the rind of three lemons as thin as possible, add one quart of boiling water, and a quarter of an ounce of [illegible]. Let them stand till next day covered, then squeeze the juice of eight lemons upon half a pound of lump sugar; when the sugar is dissolved, pour the lemon and water upon it, mix all well, strain, and it is ready for use.

87. *Arrowroot and Black-Currant Drink.*

Take two large spoonfuls of black-currant preserve, boil it in a quart of water, cover it, and stew gently for half an hour, then strain it, and set the liquor again on the fire; then mix a teaspoonful of arrowroot in cold water, and pour the boiling liquor upon it, stirring meanwhile; then let it get quite cold, and strain.

To complete this section, reference must be made to artificial digestion and the medicinal value of certain ferments known as Enzymes, viz., ptyalin (salivary diastase), pepsin, and pancreatin; papaïn, a ferment belonging to the same class of bodies, must also be mentioned.

It may be said, to begin with, that the treatment of difficult digestion by the administration of these ferments belongs really to isopathy, and that as such it should perhaps have been considered along with the animal extracts, but there are advantages in keeping in one section the action of these enzymes and of associating them directly with food and preparations of food. It should further be added that the use of the enzymes, though eminently reasonable, has proved very disappointing in the hands of many, a fact perhaps to be explained by the great variability in the activity of the several preparations in the market; whence the importance of securing them from reliable sources.

THE DIGESTIVE FERMENTS

Extract of Malt, Maltine. Of these there are a great many commercial examples; Sir Wm. Roberts mentions as the best brands, "Corbyn's, Kepler's, Trommers', and the variety called 'Maltine,'" and these, he says, are practically identical in character and merit. He proceeds: "Malt extracts are essentially infusions of malt concentrated by evaporation to the consistency of thick treacle. In order to preserve the activity of the diastase, which is destroyed by a heat exceeding 170° Fah., the evaporation is conducted at a low temperature *in vacuo*. . . . They consist chemically (besides water) of about 70 per cent. of a variety of sugar called 'maltose,' 2 per cent. of salts, a varying quantity of diastase, and about 6 per cent. of nitrogenized compounds. . . . From these facts it may be gathered that the value of malt extract as a food is but little more than so much syrup, and that the statements made, on this point, in the advertisements are ridiculous exaggerations."[1] He adds, however, that they are valuable as especially for cod liver oil, which they suspend perfectly and re tolerable to the delicate stomach, but that "the proper value of malt extracts must be held to depend entirely on nt of diastase which they contain." Roberts adds to the alt preparations the infusion of malt, which he thus pre- Three ounces (or three piled-up tablespoonfuls) of crushed thoroughly well mixed in a jug with half a pint of cold 'he mixture is allowed to stand over-night—that is to say, r twelve hours. The supernatant liquor is then carefully off from the sediment and strained through two or three auslin until it comes through fairly clear and bright." The yielded is about six ounces. The action of this infusion te as powerful as that of average specimens of malt extracts." ion may be kept by adding a few drops of chloroform and rking it in a bottle. If the taste of chloroform be objection- erts advises that the dose be poured out beforehand into a thed wine-glass and let stand a couple of hours in a warm re taking; the chloroform will then have evaporated.

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[1] *Digestion and Diet.* Sir Wm. Roberts, M.D., F.R.S., 1897, pp. 223 *et seq.*

ctract is administered in doses of one or two dessert-spoonfuls, ith water or milk. Malt infusion in similar dose and like

n at meal-times, the preparation should be sipped "*during ress of the meal*," so as to supplement the saliva and to complete intermingling of the malt extract with the food; , in order that it may early gain access to the stomach e acidity predominates,[1] for when this becomes pronounced ase ceases to act. Roberts points out that the syrupy ex- ay be advantageously spread on bread or toast, or mixed y kind of farinaceous pudding, gruel, or porridge." In the e care must be taken that the pudding, etc., is not at a ure higher than the mouth can tolerate or the ferment will yed. The diastase acts very quickly, and a gruel of wheat- tmeal, pearl barley, etc., is within a few minutes changed in liquid by conversion of the starch—one tablespoonful of *usion* suffices for half a pint of gruel. In this latter way, mixing beforehand (ware high temperature) we can more or igest the starch, and we thus have at our disposal another using the digestive. *Do not, as is often advised, give the at the end of the meal,* when the inhibiting acidity of the will be well advanced.

s sums up his considerations on Malt Infusion thus:—"Al- nferior in diastasic power to an active pancreatic extract, malt infusion has the great advantage of not imparting to the food any unpleasant flavour; and its deficiency in strength is easily compensated by the use of larger quantities. . . . Malt infusion should be regarded as a household remedy." It has the great advantage of cheapness over the extracts. Crushed malt may be obtained at any provender shop.

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[1] cidity of the gastric contents is at first very feeble; indeed in man, ases at least, for some little time after the beginning of a meal no is present, and during this period the conversion of starch into sugar inue. Foster's *Physiology*, 1895, 6th edition, part II., p. 497.

"In the digestive and intestinal troubles of infancy, when milk cannot be tolerated, a strong gruel predigested with malt infusion mixed with an equal volume of beef tea or other meat decoction constitutes, as I have often proved, an exceedingly valuable resource."[1]

Taka-diastase.—A new and very active preparation of diastase has been recently introduced under the name of Taka-diastase. This, which is obtained from a species of fungus, Eurotium oryzæ, belonging to the Aspergillus family, was discovered by a Japanese chemist, Jokichi Takamine. Taka-diastase is said to be capable of converting 100 times its weight of dry starch, whereas the best malt extract is stated to possess not more than the twentieth part of this conversion power. The dose in powder or tabloid form is from 1–5 grains. It has been claimed for this preparation that it is not destroyed by gastric digestion, and that therefore when this act is completed the diastase will again come into play and reinforce the pancreatine. We shall do well to receive this statement with scepticism, for the experiments of Sir W. Roberts[2] indicate that the usual salivary and pancreatic ferments are destroyed by full gastric digestion; on this point he is at issue with Defresne and other observers in Paris. We therefore recommend that Taka-diastase should, like all other ferments of the class, be administered during the progress of the meal.

Pancreatin.—Of this ferment there are several active preparations obtainable: *e.g.*, Benger's preparations (the Liquor pancreaticus, the Pilula pancreatica and alkaline powder); also Fairchild's preparations, of "Zymine," and an excellent pancreatine prepared by Savory & Moore. Pancreatic extracts are active in neutral, alkaline, or feebly acid media, and accordingly their value when given by the mouth must be in the earlier stages of gastric digestion, before the stomach has reached the higher degrees of acidity. They should, therefore, like the diastasic preparations, be administered during the progress of the meal, so as to co-operate with the saliva. This may be managed either by dissolving in water and sipping during mastication, or by mixing the powdered pancreatine with the salt on the side of the plate and salting the food with the admixture. In this way both the starch and the proteids will be attacked and digestion facilitated; other minor actions, curdling and emulsifiant, will also be present and assist. After gastric digestion has reached its height, with full acidity the pancreatic extract is probably destroyed. In order to

[1] Roberts, op. cit., p. 231. [2] Ibid., pp. 55–57.

prevent this destruction and keep the ferment for intestinal use alone it is sometimes prescribed in pill form coated with keratine, which coating resists the action of acids.

Another use of pancreatic extracts advised by Roberts is to add the digestive to the food fifteen to twenty minutes before it is eaten: "A teaspoonful or two of the liquor pancreaticus should be stirred up with the warm food as soon as it comes to table." Farinaceous foods of all kinds are suitable for this treatment, and "no addition of alkali is required"; the only point to secure is that the food *throughout* shall not exceed a temperature which can be tolerated by the mouth, *i.e.*, shall not exceed 140° Fah.

"Pancreatic extract is peculiarly adapted for administration with nutritive enemata. The enema may be prepared in the usual way with milk gruel and beef tea, and a dessert-spoonful of liquor pancreaticus added to it just before administration."[1]

The liquor pancreaticus is usually given in dose of 1–2 teaspoonfuls, the various dry pancreatic extracts in dose of 2–4 grains, but failing these doses it will be well to try larger ones before abandoning their use.

Pepsin.—This ferment attacks albuminoid principles, dissolving them, and in this respect it resembles trypsin, the albuminoid ferment of the pancreas; but according to Roberts the action of these two, though similar, is not identical: "there is a markedly larger production of leucin and tyrosin in tryptic than in peptic digestion." Further, Roberts points to the difference in action according to the nature of the proteid. "Milk is much more readily digested by pancreatic extracts than by artificial gastric juice; but in the case of egg albumen, the advantage lies decidedly with the gastric juice."

The solution of egg albumen effected by the acid pepsin appears, however, to be an incomplete act, preparatory, perhaps, as suggested by Bernard, for the amount of peptone actually formed is not great; and when the acid chyme is neutralized in the intestine, nearly all the modified albumen is reprecipitated to be then again attacked by the intestinal juices.

The speed with which peptic digestion obtains varies greatly according to the percentage of pepsin present; roughly, it is proportionate to the amount of pepsin.[2]

Of preparations, Bullock's acid glycerine of pepsin is one of the best, it is given in dose of 1 or 2 drachms; Benger's Liquor pepticus is given in the same dose. Besides these, there are the usual dry preparations, official and others. The dose of dry pepsin is from 2–5 grains, but H. C. Wood considers that its value has been much overestimated, and that the doses recommended are ridiculously small; he advises that at least half a drachm of the usual commercial article or of the saccharated pepsin U.S. should be given at one dose. Inasmuch as the speed of gastric digestion is "roughly" proportionate to the amount of pepsin present (*vide supra*) it is probable that we might with advantage raise the official dose considerably. The best time for administration will be during the latter half of the meal or directly after it.

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[1] Roberts, *op. cit.*, pp. 217, 218. [2] *Ibid.*, p. 181.

There is some evidence in favour of the taking of a small quantity of soup at the commencement of a meal, since Schiff has brought forward experiments to show that solutions of dextrine and of meat infusion among other substances favour the secretion of pepsin. To such he has given the name of *peptogens* (*see* Roberts, *op. cit.*, p. 54).

Papaïn, derived from the *Carica papaya*, or papaw tree, is an active principle which is extracted from the dried juice of the fruit. It belongs to the same class of ferments as pepsin and trypsin, attacking proteids and dissolving them; but according to Sydney Martin its action resembles trypsin more closely than pepsin. Conflicting statements are made as to the reaction of the medium suitable for its activity; it is generally said that it acts equally well in acid, alkaline or neutral solution, but some authorities have maintained that an acid solution arrests its activity. Under these circumstances it will be acting on the safe side to administer the digestive during the earlier part of the meal, so that at any rate it may begin its action before the acidity has become marked. The dosage is set down by some at 1–8 grains suspended in water, but Wood gives it as 5–10 grains, and the larger quantity is likely to prove the more successful.[1]

Papaïn may be tried in cases which have resisted the employment of pepsin and pancreatin. Finkler's papaïn has chief repute.

Of peptonized foods there is a very long list in the market. Sir William Roberts gives the preference to two: Darby's Peptonized Fluid Meat (Savory & Moore), and a preparation of peptonized meat by Benger. These he considers "much superior to any of the meat extracts hitherto introduced." He advises wisely, however, that when through any length of time it is necessary to aid assimilation by predigestion, the preparation should be made in the home by means of digestives (*see* receipts for peptonized milk, peptonized milk-gruel, and peptonized beef tea.)

[1] The solvent powers of papaïn over proteids have been made use of in the destruction of morbid tissues, *e.g.*, warts and callosities, etc.; a solution of one part of papaïn in two parts *each* of water and glycerine has been highly commended as a paint in diphtheria, to remove the false membrane. The application should be frequent, viz., every hour (*see* Wood, *Therapeutics*, p. 956).

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Acids, 159. Given shortly before a meal.
— 163, 164. Hydrochloric or nitric in small medicinal doses before meals for acidity from whatever cause it arises, especially for acid pyrosis; after meals for alkaline pyrosis.
Alkalies, 182. Only palliative; bicarbonates best; if the escape of carbonic acid is troublesome, substitute magnesia if bowels confined, lime-water if relaxed.
Bismuth, 115, 240. The nitrate combined with morphia or opium, and sometimes with magnesia; also with charcoal, 115.
Charcoal. *See* Flatulence, 114.
Ipecacuanha, 439. In acidity of pregnancy.
Magnesia, 198, 199. The oxide better than the carbonate—only a temporizing remedy—acids far better.
Mercury, 269. Half a grain of grey powder three times a day when accompanied by clayey stools.
Nux vomica, 115, 163, 572. Two or three or five drops just before meals.

Acne.

Arsenic, 158. Liq. arsen. given with bromide prevents its causing bromic acne.
Belladonna, 529. Locally, of some slight service.
Hot fomentations, 82, 87. Hot sponging for acne indurata.
Iodide of sulphur, 118. An ointment in a. indurata and rosacea, also in bromic acne, 158.
Mercury, 258. In early stages a lotion of corrosive sublimate, one part; alcohol, enough to dissolve it; water, 100 parts. A teaspoonful of this to be added to a quarter of a pint of water and the face sponged with it night and morning.
Onion as diet, 126.
Phosphorus, 316. In acne indurata.
Soap, 118, 177. With hot water several times a day. If this irritates, rub in glycerine of starch after each washing.
Sulphur, 118. As lotion for acneform eruption with disordered menstruation. In severe forms an ointment of hypochlorite or iodide of sulphur: use of sulphur also in acne rosacea, 119.
— 121. Sulphur may be used internally.

Acromegaly.

Pituitary body, Extract of, 664.

Addison's Disease.

Suprarenal extract, 662.

Ague.

Antimony, Tartar emetic, 288.
Arsenic, 309. The best remedy except quinine. Especially useful in long-standing agues of quartan type.
Chamomile, 627. Has been used.
Emetics, 288. Many cases may be cured by emetics and one each morning will assist the action of quinine. Ipecac. and other emetics should be preferred to antimony.
Eucalyptus, 426. Inferior to quinine.
Hyposulphite of soda, 172. Fifteen to twenty grains every two hours.
Narcotine, 570. Said by some to be superior to quinine.
Nitrite of sodium, 411. To avert cold stage.
Nitro-glycerine, 409. To avert cold stage.
Quinine, 606, 607, *et seq.* By far the best remedy we possess for intermittent fevers.

In mild forms small doses several times a day.

In malignant forms large doses given in a non-febrile period, 608.

The drug should not be discontinued for some time after all symptoms have disappeared.

It is of service as a prophylactic against ague.

It may be administered hypodermically or by the rectum—ether is the best solvent for injection.

Ague—*continued*.

Cinchonine, quinidine and cinchonidine are all useful in ague, but less so than quinine, 609.
Salicylic acid, 616. As an adjunct to quinine.

Albuminuria. (*See* Bright's Disease.)

Alcoholism. (*See* Dipsomania.)

Actæa, 465. In drunkard's stomach.
Arsenic, 5. Indicated by red, clean, smooth, irritable tongue.
—— 291. For vomiting.
Cocaine, 602. Internally.
Morphia, 556. With tonics before meals for pain, nausea, and want of appetite.
Phosphorus, 316. In chronic alcoholism.
Strychnia, 576, 577. Hypodermically in increasing doses has been highly recommended, also in multiple neuritis from alcoholism.

Amaurosis. (*See* Eye Diseases.)

Amenorrhœa.

Aconite, 475. When menses suddenly checked.
Actæa racemosa, 465. Generally, and when menses checked.
Aloes, 630. At the periods, together with hot pediluvia, friction, stimulating liniments, etc. For general directions *see* ref.
Apiol, 424.
Chloride of ammonium, 211. For headache.
Cold sponging, 72.
Ergot, 589. Where anæmia—after the use of iron.
Iron, 234. To remedy the anæmia.
Mustard, 431. A mustard sitz-bath a few days before and during the time the missing discharge is due. A course of these baths assists the restoration of the uterine functions.
Permanganate, 238, 239. Useful when flux scanty or delayed, or even when absent for a long period. It may restore it after two years. Also when a chill prevents or delays flow. It acts with plethoric as well as with anæmic patients. 1 gr. in pill thrice daily till catamenia, then discontinue till four days before next period due and continue till flow ceases.
Santonine, 640. A 10 gr. dose on two successive nights, especially when chloro-anæmia.
Sitz-bath, hot, 67. For six days before the period. Mustard may be added at the period. Often effectual in sudden suppression, also in deficient flow.
Sitz-bath, tepid. 60°-80° Fah., p. 55., to augment the catamenial flow: frictions after bath.
Spinal ice-bag, 91. Applied to lower dorsal and lumbar vertebræ.

Anæmia. (*See also* Pernicious Anæmia.)

Acids, 166. Added to purgative salts as tonic to mucous membrane.
Arsenic, 297.
Cold sponging, 72.
Hygienic conditions very important, 235.

Anæmia—*continued*.

Hypophosphites, 209. Of lime or soda.
Iron, 231, 232, *et seq.* Some stomachs with irritable mucous memb. require bland preparations. A flabby tongue indicates large doses of astringent preparations, as perchloride or sulphate. *See* also p. 5. Weak anæmic girls with pain and vomiting after food require larger doses of the tinct. perchlor. It is sometimes well to humour the stomach by changing the preparation, p. 236. Some persons are quite unable to take iron in any form. Iron may be given in anæmia with disturbance of uterine functions, and should be conjoined with nourishing food, pure air, light, and, if necessary, purgatives. If the anæmia is of pernicious type or is due to organic disease, iron at best only palliative.
Phosphate of Lime, 207. In anæmia of growing persons, and of women weakened by rapid child-bearing or excessive menstruation.
Quinine, 611. For badly fed, pale town-livers.
Red bone-marrow, 663. In pernicious forms.

Aneurism.

Chloroform, 375. Inhalation, if great dyspnœa.
Iodide of potassium, 146. Combined with recumbent position and restricted diet.
Lime salts, 200.

Angina pectoris.

Antipyrine, 622.
Arsenic, 309. Lessens severity of attacks.
Ether, 377. Or spirits of chloroform in full doses very useful.
Iodide of potassium, 146.
Morphia, 564. Hypodermically.
Nitrite of amyl, 401. Inhalation most valuable.
Nitrite of sodium, 410. 1 gr. several times a day.
Nitro-glycerine, 407, 409. Often superior to amyl, being more persistent in its effects. 1-100th min. in water or in a tablet at stated intervals, and an additional dose on onset of paroxysm.
Phosphorus, 316. Often serviceable.
Sodium iodide, 146. Has been tried.

Anthelmintics. (*See* Worms.)

Anus, pain after operations at.

Ice, 89. Applied in bladder.

Anus. (*See* Fissure of.)

Anthrax.

Carbolic acid, 350. Topically.
Salicylic acid, 613. Less efficacious than carbolic acid.
Serum treatment, 651. Lacking at present.

Aortic disease. (*See* Heart Diseases.)

APHTHÆ.

Acids, 162.
Alum, 226. Applied dry a few times a day to aphthous ulcers which will not heal—generally, however, chlorate of potash and a purgative sufficient.
Borax, 180. With honey or as glycerine of borax.
Chlorate of potash, 222.
Glycerine of borax, 332.
Glycerine of tannin, 338; in aphthous sore throat.
Nitric acid, 162. In small doses.

APOPLEXY.

Croton oil, 331. As purgative one-fourth or one-third minim every hour.
Elaterium, 629.

APPETITE, LOSS OF. (*See* DYSPEPSIA.)

ASCITES.

Caffeine, 592.
Calomel, 275.
Copaiba, 423. In some forms of ascites.
Elaterium, 628. Must be given with caution.
Pilocarpine, 513.

ASTHMA AND QUASI-ASTHMA.

Aconite, 470. Given at commencement of the fever often averts the attack. Useful also in the asthma following coryza and sneezing in children.
Alum, 229. Ten grs. powdered and placed on the tongue said to arrest a paroxysm.
Antimony, 287. In an affection of children like asthma (*see* ref.); dissolve a grain of tartar-emetic in half a pint of water, and give a teaspoonful of this every quarter of an hour for the first hour, then hourly. If vomiting induced, lessen the dose.
Antipyrine, 622.
Apomorphine, 451.
Arsenic, 298, 299, *et seq.* As cigarettes, caution required (*see* ref.), also one drop of liq. arsen. three times a day in attacks of sneezing with coryza, frontal headache and itching of nostrils. These attacks may be brought on by cold, by meals, by local irritation, or in children are consequent on bronchitis. These cases are allied to dyspeptic and bronchitic asthma, and to hay fever (*see* cases, pp. 299, 300, *et seq.*).
Assafœtida, 428.
Belladonna, 536. Large doses required, but very satisfactory (*see* ref.).
Blisters, 107, 108. For oppression of breathing especially in bronchitic asthma.
Cannabis indica, 584. Has been found useful.
Carbonic acid gas, 115. As inhalation.
Chamois leather waistcoat, 76.
Chloral, 382. Often useful in a full dose during a paroxysm.
Chlorate of potash, 220. With nitre to saturate blotting paper, or a pastile may be made of chlorate and nitrate of potash with lycopodium.
Chloroform, 366. Often combined with opium.
—— 375. As inhalation if great dyspnœa. A few whiffs will sometimes avert a paroxysm. As liniment rubbed on chest for an hour daily in bronchitic asthma.

ASTHMA AND QUASI-ASTHMA — *continued.*

Cocaine, 603.
Coffee, 592. A small cup of very strong coffee often useful in a paroxysm.
Colchicum, 458. In gouty subjects.
Counter-irritation, 107.
Ether, 377.
Eucalyptus, 426. As cigarette.
Gelsemium, 522. Sometimes beneficial.
Grindelia robusta, 523. Three grs. of extract thrice daily to prevent attacks, or m. xx to m. xxx of liquid extract every half-hour or hourly from onset of paroxysm.
Iodide of methyl, 145.
Iodide of potassium, 145. In peptic and bronchial asthma. In spray also, 2 per cent.
Ipecacuanha, 443, 444. The wine as spray to the fauces sometimes useful in severe bronchial asthma, but not of much service in genuine asthma—for Dr. Hyde Salter's observations on the general management of asthma, *see* p. 448.
Lobelia, 581. Ten drops of the simple tincture every ten minutes or quarter of an hour as soon as signs of a paroxysm appear till the dyspnœa gives way.
In bronchitic asthma where breathing a little tight all day but much worse at night, ten mins. three times a day with additional doses at night.
This drug must be given cautiously when there is heart disease.
Morphia, 567.
Nitrate of potash, 219, 220. The inhalation of fumes of burnt nitre paper will sometimes avert a paroxysm. Different methods of preparation useful for different cases (*see* ref.).
Nitrite of amyl, 402. As inhalation.
Nitrite of sodium, 410. In nervous and bronchial asthma and that of Bright's, but useless where emphysema.
Nitro-glycerine, 409. In the paroxysms.
Opium, 567. In some cases. In others morphia will induce a paroxysm.
Pilocarpine, 512. Hypodermically, Dr. Berkart.
Silver, nitrate of, 253. Sometimes injected into trachea.
Stramonium, 550. Twenty grs. of the dried leaves or ten of the powdered root may be smoked. Datura tatula sometimes better. Stramonium preparations often bad. Asthmatics advised to grow the drug themselves.
Sulphurous acid, 171. Inhalation, spray or fumigation.
Tar, 346. In bronchial asthma.
Tobacco, 497. Smoking sometimes gives relief.
Turkish baths, 76. In bronchial asthma.

BALDNESS.

Ammonia liniment, 194.
Pilocarpine, 513. Locally. With cantharides and soap liniment (*see* formula).

BARRENNESS.

Iodide of potassium, 145. When due to syphilis.

BED-SORES.

Alcohol, 354. As brandy or eau de Cologne to harden skin of parts exposed to pressure.

BED-SORES—*continued.*

Catechu, 338. The tincture with liq. plumbi locally to prevent sores.
Charcoal, 86. Sprinkled over the black slough, which is then covered with a poultice.
Glycerine, 333. Or glycerine cream rubbed over part exposed to pressure after washing morning and evening, is one of the best preventives of bed-sores.
Iodoform, 396. Dusted over sores.
Silver, nitrate of, 251. A solution twenty grs. to the oz. to be painted on threatened but unbroken skin as soon as it becomes red to prevent formation of bed-sores.
If nitrous ether solution used, five grs. to the oz. enough, 252.

BILE, DEFICIENCY OF.

Acids, especially Nitrohydrochloric, 165, 166.
Chlorides, 210.
Colocynth, 629.
Euonymin, 637.
Mercury, 268, 269. Frequent small doses of grey powder.
Podophyllin, 458.

BILIARY COLIC. (*See* COLIC.)

BILIOUS HEADACHE. (*See* SICK HEADACHE.)

BITES OF INSECTS, ETC.

Ammonia, 194. Weak solutions in bites of insects to neutralize the formic acid.
—— 196. In snake bite: inject into veins.

BLADDER, DISEASES OF.

Boric acid, 174. To keep urine sweet.
Cannabis indica, 584. In paralysis of.
Cocaine, 601. In irritable bladder, caution in use.
Copaiba, 423. Also cubebs and buchu in chronic inflammation of bladder and urethra.
Iodoform, 396. As suppository in painful diseases.
Pareira brava, 628. In chronic catarrh of bladder.
Sitz-bath, cold, 75. In weakness of bladder, vigorous rubbing after bath.
Strychnine, 578. In paralysis of bladder.
Sulphites, 172. Internally prevent putrefaction of urine.
Sulpho-carbolates, 252. To keep urine sweet.

BLEEDING. (*See* HÆMORRHAGE.)

BOILS.

Belladonna, 83, 126, 525. With glycerine locally to allay pain.
Camphorated alcohol, 411. Boils in the earliest stages to be smeared with this for half a minute, then, when the skin is dry, it is to be smeared with camphorated oil. A few applications said to disperse the coming boil.
Charcoal poultice, 86.
Collodion, 318. Applied at papular or pustular stage. Matter not to be let out except under Lister's plan (*see* ref.)

BOILS—*continued.*

Counter-irritation, 110. By blisters or iodine around the boil.
Menthol, 416. As 10–50 per cent. solution locally.
Onion as diet, 126.
Opium, 554. An extract of the consistence of treacle locally applied three or four times a day (*see* ref.)
Poultices, 83. To assist maturation and allay pain, may be smeared over with belladonna or opium.
Silver, nitrate of, 251. In boils beginning as a papule which maturate into a pustule and inflame and extend till large dead core produced. To be painted on at commencement—collodion, perhaps, better for these.
Sulphides, 124. Hasten maturation and prevent formation of fresh boils. No use in the boils of diabetes.

BONES, DISEASES OF.

Cod-liver oil, 325. In strumous disease.
Phosphate of lime, 207. In caries.
Sulphides, 127. In strumous disease. (See also Sores.)

BRAIN, DISEASES OF. (*See also* PARALYSIS.)

Bromide of potassium, 150, 152. When over-taxed from study, or over-application to business.
Cannabis indica, 585. In insomnia of general paralysis of insane.
Chloral hydrate, 381.
Phosphorus, 316. In cerebral softening, also in over-taxation.
Physostigma, 505. In general paralysis of insane.
Strychnine, 576.

BREASTS, INFLAMMATION OF. (*See also* MAMMARY ABSCESS.)

Belladonna, 525, 526. Especially as liniment to check secretion of milk when inflammation imminent. When inflammation has set in, continuous application of belladonna for twenty-four hours often arrests it. It is also useful when an abscess has formed. Fomentations useful in addition, but skin must be dried well before the belladonna is rubbed in. Also with ice bag, 526.
Digitalis, 488. Infusion locally.
Tobacco, 495. Ointment of, belladonna better.

BREATH, FOUL.

Camphor, 411.

BRIGHT'S DISEASE.

Aconite, 473. Should be given immediately on the appearance of inflammation of the kidneys in scarlatina.
Alkalies, 190. Citrates and acetates in acute and chronic Bright's, being reputed to act as diuretics.
Bitartrate of potash, 218, 634. To prevent dangerous accumulations in cellular tissue or important cavities. Also to draw off effete matters. Care must be used, as it is a brisk purgative and so is weakening.

Bright's Disease—*continued.*

Bromide of potassium, 150. For convulsions.
Cannabis indica, 184. In acute and chronic forms as a diuretic, said to be specially useful where bloody urine.
Cantharides, 435. After subsidence of acute stage, a one min. dose every three hours will stop the hæmaturia.
Chloral, 382. In uræmic convulsions.
Chloroform inhalations, 374. In uræmic convulsions.
Cod-liver oil, 325. In chronic forms.
Copaiba, 423. Sometimes useful in removing dropsy.
Digitalis, 485. Very valuable in some cases; only diuretic as long as dropsy exists.
Elaterium, 628. For the dropsy—caution required.
Eucalyptol, 425. In small dose.
Incisions, 66, 105, 106. For dropsy better than hot baths. Hot fomentations with boracic acid may be employed afterwards.
Iodide of potassium, 145. Possibly only when due to syphilis, it acts as diuretic.
Iron, 5. Astringent preparations when tongue flabby and pale.
Jaborandi, 512. Especially on occurrence of uræmic symptoms. If uræmia urgent, pilocarpine may be injected hypodermically.
Jalap, 634. And other hydragogue cathartics.
Lead, 249. Diminishes the albumen?
Nitrite of soda, 411. In renal asthma.
Nitro-glycerine, 409. In headaches.
Saline purgatives, 214, 217.
Senega, 642. As a diuretic.
Strophanthus, 493. In cardiac failure secondary to renal disease.
Tannin, 340. In chronic Bright's to lessen albumen.
Tartrates, 217. Excellent diuretics.
Turkish bath, 76.
Turpentine, 419. Sometimes.
Vapour or hot-air bath, 69.
Warm baths, 68. When uræmic symptoms or dropsy well marked. Discretion needful.

Bromism.

Iodide of sulphur, 158.
Arsenic, use of, 158.

Bronchiectasis.

Creasote, 344. The "creasote chamber."

Bronchitis.

Acids, 168. To lessen secretion in chronic form.
Aconite, 473. In measles.
Actæa, 465. As an expectorant.
Alkalies, 185. In chronic bronchitis with viscid scanty secretion.
Ammonia, 195. Inhalation in chronic bronchitis to lessen over-abundant expectoration, also as stimulating expectorant, 196.
Ammoniacum, 428. In bronchitis with wheezing and abundant discharge in old people.
Antimony, 20. Small frequent doses of tartar-emetic where skin dry and hot.
—— 287. To shorten acute bronchitis (*see* Inflammation). Also in chronic bronchitis when expectoration copious and difficult to expel.
Apomorphine, 451.

Bronchitis—*continued.*

Arsenic, 298. Where emphysema, with wheezing and not much bronchitis, especially where the wheezing has come on simultaneously with the retrocession of a rash as of eczema: where *much* bronchitis and dyspnœa, belladonna and lobelia better.
Assafœtida, 428. For old people, but ammoniacum generally better.
Balsam of tolu or Peru, or copaiba, 424. In chronic bronchitis to lessen secretion.
Benzoic acid, 422. ʒj. in boiling water as inhalation.
Carbolic acid, 344. Or creasote, twelve to twenty drops as inhalation with boiling water for abundant expectoration or fœtor; also used on dry inhaler.
Carbonate of ammonia, 196. When expectoration profuse and patient's strength diminishing, often given with chloride of ammonium, which acts similarly; also useful in severe bronchitis or bronchopneumonia of children, especially when prostrate and livid.
Carbonic acid gas, 115. As inhalation in chronic bronchitis.
Chamois leather waistcoat, 76. Worn over flannel in bronchial asthma and emphysematous bronchitis.
Chloride of ammonium, 211. In chronic bronchitis when secretion thick and abundant. May be applied by atomizer.
Cod-liver oil, 326. To control expectoration in chronic bronchitis.
Colchicum, 458. In gouty subjects.
Conium, 498. Inhalation in boiling water for irritable cough.
Counter-irritants, 108. For shortness of breath in bronchitic asthma and bronchitis with emphysema, flying blisters.
Creasote, 345. In plastic bronchitis, etc.
Croton oil, 329. With or without liq. potassæ as counter-irritant to chest—caution needful.
Cubebs and copaiba, 424.
Essential oils, 424. Balsam of Peru, Tolu and copaiba in chronic bronchitis with copious secretion of pus.
Eucalyptus, 426. Often relieves cough of chronic bronchitis.
Grindelia, 523. In later stages.
Guaiacum, 463.
Iodine, 132. The liniment to the chest to lessen cough and expectoration in chronic bronchial catarrh. As inhalation for children with hoarse, hollow cough after measles, etc. Inhalation sometimes employed in chronic bronchitis.
Iodide of potassium in chronic bronchitis, 142.
Ipecacuanha, 438. To produce vomiting in children with much mucus in bronchial tubes.
—— 443. As wine, when expectoration is profuse and difficult to expel.
The wine used as spray to the pharynx invaluable in many cases of bronchial asthma and winter cough (*see* ref.).
Iron, 237. To check profuse bronchial secretion.
Jaborandi, 512.
Jalap, 633. With bitartrate of potash to free purgation for cases where the right heart is engorged from emphysema, bronchitis, etc.
Lead, 249. To check profuse bronchial secretion.
Liquor potassæ, 186. In plastic bronchitis.
Lobelia, 582. For paroxysmal dyspnœa.
Mustard, 430, 431. As large poultice with linseed or oatmeal in acute bronchitis, or

BRONCHITIS—*continued.*

a tablespoonful added to a bath, very useful in severe bronchitis both of children and adults.
Onion, use of, 120.
Opiates, 555. Where frequent and violent cough without any signs of obstructed oxidation.
—— 569. To check excessive secretion.
Phosphate of lime, 207.
Poultices, 83. To encircle the whole chest in children.
Quinine, 610. To reduce temperature.
Senega, 642. Especially for the chronic bronchitis of the aged.
Silver, nitrate of, 253. Sometimes injected into trachea (*see* ref.).
Squill, 641. As an expectorant.
Strychnine, 578.
Sulphur, 120. Five to ten grs. in severe chronic bronchitis with abundant discharge, especially where constitutional debility.
Sulphurous acid, 171. Inhalation, spray or fumigation in chronic bronchitis.
Tar, creasote, etc., 345, 346. Two grs. in pill every three or four hours in chronic paroxysmal winter cough. Not quite equal to the ipecacuanha spray.
Turkish bath, 76.
Turpentine, 418, 419.
—— or terebine, 422. As inhalation.
Zinc, oxide of, 282. For profuse bronchial secretion.
—— sulphate of, 281. As emetic; others generally preferred.

BRONCHOCELE. (*See* GOITRE.)

BRONCHO-PNEUMONIA. (*See* BRONCHITIS.)

BRUISES.

Capsicum, 432. A strong tincture applied with gum said to act like a charm on discoloured bruises.
Hamamelis, 341. On lint or cotton wool.
Sulphurous acid, 170. A solution constantly applied.

BUBO.

Iodine, 134. Applied to produce vesication round a bubo relieves the inflammation.
Nitric acid, 160. To indolent and broken bubo.

BURNS.

Boracic acid, 173, 174. As ointment.
Capsicum, 432. To burns not blistered.
Carbolic acid, 349. A one per cent. solution on lint frequently renewed relieves pain; also as an addition to carron oil.
Cocaine, 602. As lotion painted on scalds to relieve pain.
Collodion, 317. Painted over slight burns subdues inflammation.
Lead, white, 244.
Lime, 201. As lime-water and oil (carron oil).
Paraffin, 174.
Soda, 178. A saturated solution of the carbonate locally for burns and scalds.
Warm bath, 67. Immerse for some days. Local burns, as of a limb, may be treated by the continuous bath.

CALCULI.

Acids, to dissolve phosphatic calculi, 160. Very doubtful treatment.
Alkalies, 184. To dissolve uric acid calculi (renal or vesical).
Citrate of potash, 190. In large doses for patients with bloody urine containing quantities of uric acid crystals.
Counter-irritants, 107. Relieve pain from passage of renal and biliary calculi.
Nitric acid, 168. Very dilute as injection for phosphatic calculi.
Piperazine, 665. To dissolve uric acid.

CANCER. (*See also* STOMACH *and* UTERUS.)

Arsenic, 289. Arsenious acid, pure or with starch, as a caustic—enough should be used to set up the active inflammation (*see* ref.).
—— 309. A long-continued course recommended in epithelioma, scirrhus, and rodent ulcer.
Carbolic acid, 349. Pure, as anæsthetic before applying caustics.
Carbonic acid, 115. Injected up vagina in cancer of uterus to relieve pain.
Chloral, 383. In ten gr. doses three times a day, has relieved most severe pain of cancer.
Chloroform, 365. As vapour to raw, painful surface.
Conium, 498. As poultice to ease pain.
—— 501. Internally to relieve pain.
Creasote, 345. Has been employed.
Eucalyptol, 426. In cancer of rectum or uterus.
Glycerine of carbolic acid, 333. As application to fœtid cancers on surface or in uterus.
Glycerine of tannin, 337. With glycerine of carbolic acid checks discharge and stench of uterine cancer.
Iodoform, 396. Applied locally relieves the pain of cancerous sores.
Morphia, 554. Dissolved in glycerine and spread on lint, very useful where there is much pain. Opium is also used in cancer of the stomach, 556.
Opium, 554. To cancerous sores.
Poultices, 85. Of starch, also charcoal poultices, 86.
Warm enemata, 99. To relieve pain and straining in intestinal cancer, and cancer of neighbouring organs.

CANCRUM LABIALIS AND ORIS.

Arsenic, 305. In cancrum oris.
Nitric acid, 160. To surface.

CANKERY TASTE.

Mercury, 460. If podophyllin fail.
Podophyllin, 460. When unconnected with alcoholism.
Purgatives, 460. Mercury and podophyllin generally best.
Water, 94. Half a tumbler of pure cold water daily half an hour before breakfast.

CARBUNCLE.

Arnica, 318. Ointment on plaster, also internally.
Belladonna, 83, 126, 525. With glycerine as local application to allay pain.

CARBUNCLE—*continued.*

Carbolic acid, 350. Lint soaked in glycerine or oil and carbolic acid to be thrust into discharging sinuses, the whole to be covered over with more lint similarly prepared; spray, etc.
Counter irritation by blisters, 110.
Iodine, 134. Applied so as to produce vesication round the carbuncle, reduces inflammation.
Menthol, solution of, 416.
Opium, 554. An extract of the consistence of treacle applied three or four times a day (*see* ref.).
Poultices, 83. The inflamed surface having been previously smeared with belladonna and glycerine.
Strapping, 318. Plaster concentrically from border inwards, will sometimes arrest extension.
Sulphides, 125. Internally.

CARDIAC FAILURE. (*See* HEART DISEASES *and* DROPSIES.)

CARIES.

Phosphate of lime, 207.
Soft soap, 182. Applications of.

CATARRH. (*See also* BRONCHITIS.)

Aconite, 470. In catarrh of children and in measles.
Actæa racemosa, 465. Has been given, it is said, with much success, when headache, stiffness of muscles, and dull aching pain in bones.
Antimony, 286, 287, 288. As tartar-emetic in acute catarrh of children, which is often accompanied by vomiting and diarrhœa.
Apomorphine, 451. In acute and chronic catarrhs.
Camphor, 412.
Carbonate of ammonium, 197.
Chlorate of potash, 222. Should be taken early and frequently, eight or ten lozenges in the twenty-four hours.
Chloride of ammonium, 196, 211. In chronic catarrhs of bronchial, intestinal and urinary mucous membrane when secretion thick and abundant.
Cubebs, 424. ʒss. to ʒj. of the tinct. in linseed tea thrice daily. Very useful in coughs due to chronic catarrh, or those following influenza, or a simple acute catarrh, or occurring in emphysematous patients.
Eucalyptol, 426. In chronic bronchial catarrh and bronchorrhœa.
Hamamelis, 342. Snuffed up nose in colds of the head and catarrh of mucous membrane.
Hot sponging, 68. For headache.
Iodide of potassium, 142. Five grs. of, ½ gr. tartar-emetic, 1 oz. syrup of orange peel, 3 ozs. of water in teaspoonful hourly doses for acute febrile catarrh, specially for children.
Iodine, 132. Painted over back and front in chronic bronchial.
Iodoform, 398. In spirits of turpentine.
Ipecacuanha, 438. In catarrh of stomach or lungs, especially when secretion from lungs abundant and tenacious.
Lamp bath, 79.
Menthol, 416.
Opium, 555. Or morphia may be given when there is violent and frequent cough but no signs of obstructed oxidation.

CATARRH—*continued.*

Saline springs, 212.
Sulphides, 123. As natural waters highly efficacious in chronic catarrh of the pharynx.
Turkish bath, 76, 79. In chronic catarrh.
Warm or hot foot-bath, 67. Before going to bed.

CATCH IN THE BREATH.

Cold sponging, 71. For infants waking with a catch in the breath at night.

CEPHALALGIA. (*See* HEADACHE.)

CHANCRE. (*See* SYPHILIS.)

Caustic alkalies, 175. To hard edges.
Eucalyptol, 425. With iodoform applied to both kinds of sores.
Iodoform, 396. Dusted over soft chancres.
Iodol, 399.
Nitric acid, 160. To soft chancres.

CHANGE OF LIFE.

Actæa, 465, 466. For headache.
Ammonia, 194. As Raspail's sedative lotion to be applied to the painful part of the head in the headaches of this period.
Bromide of potassium, 153. For despondency with sleeplessness and irritability, often also with heats, flushings and perspirations.
Calabar bean, 506. For flatulence.
Camphor, 412. For drowsiness and headache, eau de Cologne saturated with camphor to be rubbed into the head. Also internally in flatulence of, 412.
Change of air and scene, 154. Where other treatment only partially successful.
Eucalyptol, 426. For various symptoms, as palpitations, flushings, flatulence.
Gelsemium, 523.
Hot sponging, 75. To spine, following by application of cold sponge.
Iron, 154. For flutterings of the heart.
——, 236. Large doses of sesquichloride three times a day in fluttering of heart with fulness of head, heat, and weight on the vertex, frequent flushings and hot and cold perspirations. If symptoms limited to head and face, nux vomica, opium and belladonna more successful.
Nitrite of amyl, 154, 406. In small doses when the heats predominate.
Ovarian gland, 664.
Valerianate of zinc, 154, 282. For hysterical symptoms.
Vinegar and water sponging, 75. Every night and morning to spine; or spirits of wine and vinegar to sponge with.
Warm bath, 67. Once a week.

CHAPS. (*See* NIPPLES, SORE.)

Collodion, 317. Sometimes used, but for chapped hands and lips glycerine of starch, arnica cerate or eau de Cologne and glycerine better; for chapped nipples sulphurous acid and glycerine.
Glycerine, 332. Or, better still, glycerine of starch.
Sulphurous acid, 170. As solution or fumigation.
Vaseline and petroleum, 335.

CHEST, PAINS IN, NON-INFLAMMATORY. (*See* MYALGIA AND PLEURODYNIA.)

Belladonna, 133. When tenderness is in *skin*, pleurodynia.
Iodine, 133. As ointment in *muscular* pains, myalgia.

CHILBLAINS.

Balsam of Peru, 421. In ointment for broken chilblains.
Benzoin, Compound tincture of, 133.
Cajeput oil, 421. Locally.
Capsicum, 432. The tincture painted over unbroken chilblains, but this is inferior to iodine. For De Rheims's preparation *see* ref.
Celery, Infusion of, 132.
Iodine, 132, 133. Ointment is best.
Sulphurous acid, 170. As solution or fumigation.
Turpentine, 417.

CHLOASMA. (*See* PITYRIASIS VERSICOLOR.)

CHLOROSIS. (*See also* ANÆMIA.)

Arsenic, 297.
Ether with Iron, 377.
Hypophosphites, 209. Of lime or soda.
Iron salts, 233. When flabby tongue; combine with an aperient.
Ovarian gland, 665.
Red bone-marrow, 663.

CHOKING.

Bromide of potassium, 149. In children who choke with liquids from their birth (*see* ref.).

CHOLERA AND CHOLERAIC DIARRHŒA.

Arsenic, 292. Has been recommended for the vomiting of cholera and in collapse in the later stages.
Camphor, 413. Four to six drops of the strong spirit of camphor every ten minutes at the commencement till the symptoms abate, and hourly afterwards.
An admirable remedy for summer diarrhœa and cholera.
Chloral, 383. Hypodermically in cholera. May be combined with morphia.
Copper, 279. The salts have been given.
Inoculations against, 652.
Lead, 245. The acetate has been recommended in early stages.
Mercury, 270. A sixth of a grain of grey powder hourly is of great service in infantile cholera with incessant sickness, profuse almost continuous diarrhœa, offensive and nearly colourless stools. A starch injection with a minute quantity of laudanum assists the grey powder, and should be given in urgent cases.
Morphia, 565. One-eighth to one-fourth of a grain hypodermically of the greatest value even in the stage of collapse.
Napthalene and β Napthol, 625.
Spinal ice-bag, 92. For cramps.

CHORDEE.

Aconite, 475. In drop doses hourly. Said to remove chordee.
Camphor, 414.
Cantharides, 436. A drop of the tincture three times a day.

CHOREA.

Actæa racemosa, 465. Sometimes succeeds when rheumatic history.—Inferior to arsenic.
Antimony, 288. As tartar-emetic in increasing doses; other remedies better.
Apomorphia, 451.
Arsenic, 309. When uncomplicated very successful.
Calabar bean, 505. Three to six grs. of the powder three or four times a day for children, or ten to twenty grs. for adults.
Chloral, 381, 382. Useful, especially where the violent movements render sleep impracticable.
Chloroform, 374. Inhalations,—commence with them three times a day, often of great service in severe cases.
Cod-liver oil, 326.
Cold sponging, 71. Not if rheumatism, fever, or pain in joints. Often well to use water tepid first.
Conium, 501. Apparently only palliative.
Ether spray, 377. Has been recommended.
Hyoscyamine, 548. 1-50th gr. hypodermically or by stomach.
Morphia, 564. Hypodermically when the movements prevent sleep.
Musk, 429.
Silver, 255. Both the oxide and nitrate occasionally useful.
Sulphate of zinc, 282. In large and increasing doses (*see* ref.).
Sulphonal, 389. In the severer forms.
Valerian, 427. The preparations are said sometimes to restrain the movements of chorea.
Veratrum viride, 452. Has been employed.

CIRRHOSIS. (*See* LIVER, DISEASES OF.)

CLAVUS.

Chloride of ammonium, 211.

CLERGYMAN'S SORE THROAT. (*See* THROATS [PHARYNGITIS].)

COLD FEET AND HANDS.

Sponging, 75. With vinegar and water, or first with hot and then cold water.
Cold water, 74. Cold feet should be immersed in cold water nightly for a few minutes, rubbing them all the time, they should then be dried, and warm woollen socks put on.
Spinal ice-bag, 91. For cold feet, also for coldness of body generally. (*See* mode of application.)
Strychnia, 578. For coldness of hands and feet.

COLD, FEVERISH.

Tartar-emetic, 287.
Turkish bath, 76. At commencement will cut short, also useful later on.

COLD IN HEAD. (*See* CORYZA.)

COLDS, TENDENCY TO CATCH.

COLD SPONGE-BATH, 76. Supplemented by wet-sheet packs, or Turkish bath.

COLIC.

ALUM, 228. Large doses (ten grs.) every hour given by many in lead colic.
AMMONIA, 195. In spasm of intestinal canal and in colic of children or infants from bad feeding.
ANTIPYRINE, 622. In biliary and renal colic.
BELLADONNA, 531. In colic of intestines, especially of children.
BROMIDE OF POTASSIUM, 150. In a peculiar form in young children.
CHLORAL, 383. Sometimes relieves.
CHLOROFORM, 366, 374. Inhalation in renal and biliary colic, inferior only to morphia injection, superior to opium, warm baths, etc., two or three administrations may be required; also in intestinal colic.
—— 375. ♏ v-lx. every 4 or 6 hours in biliary colic said to dissolve calculus.
—— SPIRIT OF, 366. In all colics, often combined with opium.
COUNTER-IRRITATION BY FLYING BLISTERS, 107, 108. For renal and biliary calculi.
ESSENTIAL OILS, 422. Especially of cloves and cinnamon.
ETHER, 375, 377. For biliary or intestinal colic.
FOMENTATIONS, 87. In all forms: intestinal, renal, biliary.
LIME-WATER, 202. For young children who eject much of their milk in lumpy masses, some of these lumps passing through the intestines causing colic and wind.
OPIUM, 557, 564. Or morphia in frequently repeated small doses for colic of intestines. Where, as is usual, there is constipation a purgative should be given.
—— 567. Small doses with spirit of chloroform every five or ten minutes till the pain gives way in renal or biliary colic, or morphia hypodermically, 564.
PHOSPHATE OF SODA, 217. In hepatic colic, to prevent formation of gall-stones—must be continued for months.
PIPERAZINE, 665. In renal colic.
TOBACCO, 495. As clyster or by the stomach in colic of intestines—caution.
TURPENTINE, 419. Has been given with advantage in biliary colic; Durande's remedy.
WARM BATHS, 67. To ease the pain in biliary, renal, or other colic.

COLLAPSE. (*See* EXHAUSTION.)

COMA.

BITARTRATE OF POTASH, SULPHATE OF SODA, and TARTRATE OF SODA, 214. As purgatives when blood poisoned.
BLISTERS, 106. In a comatose condition large blisters or mustard poultices should be applied in quick succession to different parts of the body—chest, abdomen, thighs, and calves—often very valuable in the critical condition near the end of an acute illness.
COLD AFFUSION OR DOUCHE, 72. For stupor of drunkenness or of opium poisoning. May have to be repeated if relapses occur. It should be kept up for a long time if pulse and breathing improve or even become no worse. Cold bath or affusion in coma of fever, 59–65.

COMA—*continued*.

CROTON OIL, 331. A purgative—one-quarter or one-third min. every hour.
ELATERIUM, 629. In apoplexy.
MUSTARD, 430.

CONDYLOMATA.

ARSENIC, 289. Arsenious acid as a caustic (*see* ref.).
BICHROMATE OF POTASSIUM, 224.
MERCURY, 256. The nitrate locally.
—— 260. Oleate (20 per cent.).
—— 263. Calomel dusted over.
NITRIC ACID, 100. As a dilute wash constantly applied.
ZINC, 279. Chloride, iodide, and nitrate locally.

CONFINEMENT. (*See* PUERPERAL FEVER.)

ACTÆA RACEMOSA, 465. Strengthens contractions of uterus without prolonging them as ergot does, and so endangers less life of child and soft structures of mother. Sometimes given for after-pains, but ergot preferable here.
Beneficial in mental disturbance before or after confinement, 466.
Useful when lochia are suppressed, 465.
ANTIPYRINE, 622. Labour pains and after-pains.
CASTOR OIL, 330. As purgative afterwards.
CHLORAL, 383. In fifteen gr. doses every quarter of an hour till sleep induced—applicable towards termination of first stage.
CHLOROFORM, 373.
COLD DOUCHE, 73. In insomnia.
EMETICS, 449. Or mechanical irritation of pharynx in flooding.
ERGOT, 588. In tedious labour where uterus is becoming exhausted, but where there is no obstruction to the passage of the child (*see* ref.).
Extremely useful in *post-partum* hæmorrhage.
HAMAMELIS, 342. For long-continued oozing of blood afterwards.
HYDRASTIS, 590.
IPECACUANHA, 449. In flooding—also recommended after delivery to promote natural functions.
IRON, 230. Injection of four ozs. of liq. ferr. perchlor. with twelve ozs. water in grave cases of flooding after delivery—care to be taken not to introduce air.
MORPHIA, 565. Hypodermically in tedious labour produced by rigid os uteri.
OPIUM, 568. A drachm of the tinct. with brandy in profuse flooding.
QUININE, 611. To strengthen uterine contractions—used by some American writers in preference to ergot.

CONJUNCTIVITIS. (*See also* EYE, DISEASES OF.)

BELLADONNA, 530. Locally and internally.
BLISTERS, 110. Behind the ear.
CASTOR OIL, 330. A drop in the eye often allays pain and intolerance of light caused by an irritant.
COCAINE, 597. In photophobia from corneal ulceration, etc.
MERCURY AND MORPHIA, OLEATE OF, 260. Outside the eyelid in palpebral conjunctivitis.
OPIUM, 554. The wine of the 1864 Pharmacopœia dropped into the eye relieves pain and improves condition of the membrane.

CONJUNCTIVITIS—*continued.*

Silver, Nitrate of, 252. Solutions of various strength dropped into the eye.
Zinc, 280. A weak solution of sulphate as drops.

CONSTIPATION.

Acids, 166. To heighten action of purgative medicines.
Aloes, 630. In chronic cases. Often combined with iron.
Alum with Bismuth, 228. In chronic constipation.
Belladonna, 531. One-sixth to one-fourth of the extract once a day, especially where dyspepsia. Sometimes a suppository of one or two grs. efficacious in severe cases.
Bitartrate of potash, Sulphate of magnesia, and Phosphate of soda, 218. In broth for children.
Carlsbad water, 215. In habitual constipation—best to use a system as at Carlsbad (*see* ref.).
Cascara Sagrada, 636. In habitual constipation.
Castor Oil, 330. A speedy, certain, and mild purgative. Not good for habitual constipation. ʒss. of the oil if rubbed up with ʒss. glycerine a sufficient dose.
Cod liver oil, 323, 326. In the obstinate constipation of children.
Coffee, 591. Is slightly purgative in some persons.
Cold water, 94. A glass of cold water before breakfast.
Colocynth, 629. A few drops of the Prussian tincture several times a day in obstinate constipation.
Croton oil, 330. A very powerful purgative, sometimes employed in obstinate constipation where other purgatives fail.
Diet, 214, 215. Porridge, brown bread and exercise when busy, worried men become irritable and suffer from headache, unless the bowels act every day. If these remedies fail, try fruit before or after breakfast, or natural purgative waters.
Enemata, 96, 97, 98. To unload the bowels, but the habitual use of warm enemata will increase the torpor of the bowels. Precautions in case of disease of the rectum.
Glycerine, 333. As an anal injection, also internally.
Guaiacum, 463.
Hydrastis, 590.
Ipecacuanha, 441. A grain every morning fasting for constipation from great torpor of intestines. It is said to assist the action of the other purgatives.
Jalap, 632. And scammony in obstinate constipation.
Kneading of the abdomen, 99. Night and morning for 10 minutes often overcomes chronic constipation, especially in children.
Lime, 204. As saccharated solution—this must not be taken on an empty stomach.
Magnesia, bicarbonate of, 199, *i.e.* fluid magnesia. A useful and mild aperient. Often combined with rhubarb; also oxide and carbonate of magnesia.
Mercury, 3. Calomel, or grey powder, as a purgative, especially if stools light. Nitric acid and nux vomica assist its efficacy. (But *see* p. 267; *see also* Cases, 269.)
Natural waters, 214. Püllna, Friedrichshall, or Hunyadi—from a wineglassful to half a tumbler or more, with an equal quantity of hot water before breakfast.

CONSTIPATION—*continued.*

Püllna or Friedrichshall mixed with milk a good purgative for children.
Nux Vomica, 673. The extr. with rhubarb or colocynth shortly before dinner, aids digestion and the unloading of the bowels. One or two drops of this tinct. two or three times a day will do instead.
Onion, use of, 121.
Oranges, 214. One or two before breakfast for moderate habitual constipation, or a glass of cold water before and an orange soon after breakfast.
Podophyllum, 460. One or two drops two or three times a day of the solution of one grain of the resin in one drachm of alcohol for children with hard, clayey, perhaps mottled stools occurring after an attack of diarrhœa (often observed in infants who are spoon-fed). Generally the best purge when stools are dark. Nitric acid and nux vomica should be given simultaneously.
For remarks on indications of the tongue, *see* p. 3.
Rhubarb, 635. A useful purgative for children, especially when mixed with two or three times its weight of carbonate of soda.
Scammony, 632.
Senna, 635. Well combined with a bitter tonic, as gentian.
Senna leaves, 98. Steeped in cold water, then warmed, an excellent evacuant.
Sitz-bath, 55, 75. Cold or tepid, followed by friction with rough towel.
Soap, 183, 184. Added to anal injections to suspend castor oil or turpentine, or a piece the size of the thumb wetted with castor oil or water may be thrust up the rectum to produce a motion, especially in infants and children.
Sulphates, 214. In purgative natural waters—small doses often repeated. Sulphate of potash has in some cases proved poisonous.
Sulphur, 119. Ten grs. with conf. sennæ, or as the German comp. liquorice powder in milk—the latter good for children.
Tobacco, 495. A smoke after breakfast sometimes beneficial in habitual constipation.
Whole-meal bread, 676. *See* Dietary.

CONSUMPTION. (*See* PHTHISIS.)

CONVALESCENCE.

Alcohol, 355. Before or at meals.
Fats, 324. Especially cod-liver oil.
Lime, 204. As lime-water or carbonate of lime, in convalescence from serious diseases.
Opium, 558. As laudanum injected into the rectum for the wakefulness of convalescents.
Sea-bathing and cold baths, 54, 69.
Turkish baths, 77. Convalescence from acute diseases.

CONVULSIONS.

Bitartrate of potash, Sulphate of soda, and Tartrate of potash, 214. When due to poisoned blood.
Bromide of potassium, 149, 150. In all forms.
Chloral, 381, 382. In children—five grs. by mouth or rectum, best as suppository.
Chloroform, 374, 375. Inhalations of great

CONVULSIONS—*continued.*

service in children, also in puerperal convulsions, also in uræmic.
Cold bath or cold affusion, 63, if due to hyperpyrexia.
Ice, 88. To head.
Morphia, 565. Hypodermically sometimes arrests puerperal convulsions. Also uræmic, 567.
Veratrum viride, 452. Has been employed.

CORNEAL ULCERATION. (*See* EYE, DISEASES OF.)

CORNS.

Arsenic, 290.
Salicylic acid, 614. (For formula *see* ref.)

CORYZA AND HAY FEVER.

Aconite, 470. In severe colds with much chilliness, aching of limbs, a hot, dry skin and quick pulse.
——304, 305. In true hay fever.
Ammonia, 195. Inhalation in early stage.
Arsenic, 298, 299, *et seq.* In chronic coryza (*see* 305). Also in periodical attacks of persistent sneezing, with coryza, frontal headache, and often an itching of the nostrils; sore throat, wheezing, and profuse expectoration may supervene. Often this affection, allied to peptic asthma, may be brought on by food or by irritation of dust or pollen. Aconite liniment may be applied to the itching part of the nose.
Arsenic of little use in true hay fever, then aconite, internally, best. (*See* p. 304.)
Camphor, 411. Inhaled or taken by the mouth at the very beginning sometimes arrests it.
Carbolic spray, 351. To nose in contagious coryza.
Chlorate of potash, 222. Eight or ten lozenges a day will stop many a cold at its commencement.
Cocaine, 305, 600. Solution for painting nasal mucous memb., also for arrest of acute coryza.
Cotton wool, piece of, 416. Saturated with menthol placed in each nostril directly sneezing and itching commence.
Hamamelis, 305, 342. Snuffed up nose in colds and hay fever.
Iodide of potassium, 142. Ten grains at bedtime at onset to cut short acute cold in head; also useful in chronic colds. (*See also* p. 304.)
Iodine, 135. Inhalation in daily attacks of cold accompanied by itching of nose or inner canthus.
Ipecacuanha, 448. In hay asthma.
Menthol, 416.
Opium, 569. At night at the very beginning will often cut short an attack of coryza. A glass of hot grog assists its action.
Quinine, 604. Strong solutions to flush nose.
Sulphurous acid, 171. Inhalation, spray, or fumigation in coryza.
Turkish bath, 76. In coryza.
Veratrum viride, 304. If arsenic unsuccessful.

COUGH.

Alcohol, 363. As brandy or wine. Porter and beer often aggravate coughs.
Alum, 227. Ten grs. to one drachm of water as spray in chronic cough; also internally in spasmodic coughs, 229.
Belladonna, 537. Often useful—no rules can be given.
Carbolic acid, 353. As a spray.
Carbonic acid gas, 115. As inhalation in irritable cough.
Chloroform, 367. With morphia and treacle when cough paroxysmal and violent with very slight expectoration; when it arises from morbid condition of throat this mixture may be painted on.
Cod-liver oil, 326. In chronic coughs.
Conium, 501. Supposed useful in whooping and other coughs.
Inhalation for irritable cough, 498.
Creasote, 345. In winter cough.
Cubebs, 424. ʒss. to ʒj. of tinct. in linseed tea in acute or chronic catarrh, influenza, or emphysema — often acts "like a charm."
Gelsemium, 518. Where excessive excitability of respiratory centre—ether, chloroform, and opium also useful. In spasmodic cough, 522.
Glycerine. 333. Lemon-juice may be added.
Glycerine of tannin, 339. As application to the throat when chronically inflamed and so productive of cough, which is often the case in children.
Grindelia, 523. In spasmodic cough.
Hydrocyanic acid, 552. For irritable cough.
Iodine, 126. Inhalation for children with hoarse, hollow cough accompanied by hoarseness and wheezing at the chest.
Iodoform, 398. Cough of phthisis diminishes.
Ipecacuanha, 443, 444, *et seq.* In obstinate winter cough with wheezing the wine applied as spray to the fauces is very efficacious.
Opium, 555. When cough due to inflamed or even ulcerated throat. Morphia lozenges or morphia with glycerine in these cases, which are common in chronic phthisis, very useful. Sometimes also opium and morphia administered so that the medicine clings for some time in contact with structures just outside the larynx effectual in coughs entirely dependent on lung disease.
Spirits of turpentine or terebine, 419. For winter cough.
Tar, 345. In winter cough, especially when paroxysmal.
Turkish bath, 76. In winter cough; also to carry off remains of a general cold, *e.g.*, hoarseness and cough.
Turpentine, 419.

CRACKED NIPPLE. (*See* NIPPLES, SORE.)

CRETINISM.

Thyroid extract, 660.

CROUP.

Aconite, 470. Valuable in catarrhal croup (spasmodic laryngitis).
Alum, 227, 228. One drachm in honey or syrup every ten or fifteen minutes, till vomiting induced. In severe cases vomiting should be caused three or four

CROUP—*continued.*

times a day, treatment to be begun early.
APOMORPHINE, 451.
COPPER, SULPHATE OF, 278. In small and frequent doses as an emetic.
LOBELIA, 582. Has been employed.
SENEGA, 642. Given by some.
SULPHUROUS ACID, 171. Spray hourly or oftener in acute attack.
TANNIN, 339. A spray containing 5 per cent. of tannin several times a day for fifteen or twenty minutes.
ZINC, SULPHATE OF, 281. As emetic, but others generally preferred.

CYSTITIS.

ALKALIES, 190. Citrates and bicarbonates used to make urine alkaline, when urinary organs irritated or inflamed. When urine already alkaline, alkalies must be intermitted.
BORIC ACID, 174. Internal use.
BUCHU, 423. Also copaiba and cubebs in chronic inflammation of bladder and urethra.
CANTHARIDES, 435. A drop of the tincture (five sometimes required) three times a day.
CARBOLIC ACID, 348. And sulpho-carbolates may possibly be used in preserving the urine sweet in cystitis.
EUCALYPTOL, 425.
GRINDELIA, 523. In chronic cystitis and pyelitis.
HYDRASTIS, 590.
HOT ENEMATA, 99. To relieve pain.
HOT SITZ-BATH, 67. Allays pain and incessant desire to micturate.
IODOFORM, 396. A suppository for painful diseases of rectum and bladder.
OPIUM, 558. An injection of laudanum with starch will subdue pain and frequent micturition.
PAREIRA, 423, 628. In chronic cystitis.
SALOL, 619. To keep urine sweet.
TURPENTINE, 419. Has been useful in chronic cystitis.

DANDRIFF. (*See* PITYRIASIS OF SCALP.)

DEAFNESS. (*See* EAR, DISEASES OF.)

GLYCERINE, 332. For dryness of meatus—also to form a film to cover ruptured tympanum.
GLYCERINE OF TANNIN, 338. As application for throat deafness.

DEBILITY.

ACIDS, MINERAL, 167, 169. Phosphoric frequently used.
ALCOHOL, 5. In aged patients with dry tongue great care must be exercised and alcohol given in small quantities, the effect on the dryness of the tongue being carefully watched (*see also* 355, 359, 361.)
——359. A wine with much ether in debility of old age, especially where sleeplessness, indigestion and stomach cramps.
——364. Stout or rum and milk, especially in town-living women.
ARSENIC, 276. For swelled feet of old or weakly persons and for breathlessness from weakly acting heart.

DEBILITY—*continued.*

COD-LIVER OIL, 324. In chronic degenerative diseases of old age.
——324, 326. In chronic diseases of children.
HYPOPHOSPHITES, 209. Of lime or soda in nervous or general debility. Use of Fellow's Syrup.
IRON, 233, &c. In anæmic subjects.
LIME SALTS, 204.
MORPHIA, 567. Hypodermically when due to onanism, and in great hysterical depression.
PHOSPHATE OF LIME, 207. When from prolonged town life or overwork, a grain each of phosphate of lime, phosphate of iron and carbonate of lime for a dose.
PHOSPHORUS. (See Depression, etc.)
QUININE, 611. For pale, badly fed town-dwellers.
SEA-BATHING AND COLD BATHS, 54. In chronic illness with debility.
SOPORIFICS, 5. In aged patients if tongue is dry great caution must be exercised.
SPONGING, COLD, 72.
TURKISH BATHS, 76, 77. When caused by the tropics—caution necessary. When town-dwellers become stout and flabby.

DELIRIUM.

ANTIMONY, 288. In delirium of typhus and other fevers. (*See* Fevers.)
BELLADONNA, 537. In delirium of typhus and other fevers.
BROMIDE OF POTASSIUM, 155. In delirium resembling delirium tremens, also in acute mania.
CAMPHOR, 413. In large doses.
CHLORAL, 380, 381. In violent delirium of fevers.
COLD DOUCHE, 73. In maniacal delirium—place patient in warm bath during the application.
OPIUM, 558. Best given in traumatic delirium as a rectal injection.
—— 561. Combined with tartar-emetic in fevers, or, better still, morphia may be given hypodermically. Laudanum in low muttering delirium.
WET PACK, 58. In states of great excitement with restlessness, as in delirium of fever.

DELIRIUM TREMENS.

ANTIMONY, 288. Tartar emetic with opium to control mania and sleeplessness.
BROMIDE OF POTASSIUM, 155, 156. Especially in earlier stages, and in dispelling delusions remaining after partial subdual of attack.
CAMPHOR, 143.
CAPSICUM, 433. To induce sleep in early stages.
CHLORAL, 155, 380. Especially when administered at the onset of the symptoms; beware weak heart.
CHLOROFORM, 374. Inhalation has been advised to procure sleep.
COLD DOUCHE, 73. For insomnia.
DIGITALIS, 489. Half an ounce of the tincture, repeated if necessary in four hours and again in six, and afterwards when needful in two-drachm doses. (*See ref.*)
HYOSCYAMUS, 547. Or Hyoscyamine probably useful where delirium like that of acute intermittent delirium.
ICE, 88. To head.

DELIRIUM TREMENS—*continued.*

Musk, 429. With laudanum.
Opium, 155, 558. Given as rectal injection.
—— 564, 566. Hypodermically or with porter or spirits. Test urine first.
Paraldehyde, 389.
Strychnia, 577. Hypodermically to calm excitement and induce sleep.
Sulphonal, 389.
Wet pack, 73. For insomnia. May be repeated.
If patient strong, delirium boisterous and pulse full, tartar-emetic or aconite should be added.

DENTITION. (*See* TEETH, AFFECTIONS OF.)

DEPRESSION AND DESPONDENCY.

Bromide of potassium, 153. Especially in townspeople.
Phosphorus, 316. In depression from overwork.
Volatile oils, 423. Depression of the hysterical.

DIABETES.

Caution.—The sugar reaction is given by urine of patients taking salicylic acid. (*See* p. 551.)
Acids, lactic and phosphoric, 168.
Alkalies, 184. Have been suggested, probably valueless.
Codeia, 569.
Ergot, 589. The best remedy in diabetes insipidus. Large doses required.
Glycerine, 333. To be used in place of sugar.
Morphia, 569.
Opium, 568. Very successful.
Salicylate of soda, 618.
Tepid drinks, 93.
Valerian, 427. Large and increasing doses in diabetes insipidus.

DIARRHŒA.

Alcohol, 356; in form of brandy.
Alkalies, 183. Bicarbonates of potash, soda or magnesia when due to excess of acid in intestines.
Alum, 228. Sometimes useful in acute and chronic diarrhœa, and in that of typhoid and dysentery.
Ammonia, 195. In after stages when mucous membrane continues to pour out watery secretion which perpetuates the diarrhœa.
Arsenic, 292. One drop of liq. arsen. before meals for dyspeptics when diarrhœa excited by food.
Also useful in other chronic forms of diarrhœa, even when due to organic disease.
——292. For copious discharge of membranous shreds from bowels and uterus with emaciation, neuralgia, dysmenorrhœa, etc.
Attention to feeding, 271, 272. Small quantities of food frequently.
Bismuth, 241. Half a drachm to a drachm of the nitrate in chronic diarrhœa as in that of phthisis sometimes valuable when all else has failed—should be given in milk.
A grain hourly with milk with sometimes one-sixth gr. grey powder in various forms of diarrhœa of young children.

DIARRHŒA—*continued.*

Camphor, 413. In summer diarrhœa, in acute diarrhœa of infants (may be given in milk), in diarrhœa caused by effluvia of drains, or exposure to cold.
Capsicum, 433. In summer diarrhœas and in those persisting after expulsion of exciting irritant.
Castor oil, 331. In early stages to carry away irritant.
Children's diarrhœa sometimes yields to eight or ten drops suspended in mucilage.
Chamomile, 627. An infusion useful in summer diarrhœa of adults, or of children from teething.
Chloride of ammonium, 211. In catarrhal conditions of intestines.
Chloride of calcium, 205. In chronic diarrhœa with weak digestion.
Chloroform, 366. As sp. chloroformi combined with astringents and opium after removal of excitant.
Cocaine, 603. As anal injection or suppository to check diarrhœa.
Cod liver oil, 326. In chronic diarrhœa of children, with pale stinking motions, wrinkled skin and perhaps vomiting.
Cold or tepid packing, 57. In summer diarrhœa of children; in chronic diarrhœa, as in those coming from tropical climates.
Copper sulphate, 278. By mouth or as an injection in severe chronic or acute diarrhœa with or without organic disease.
Coto bark, 342. Most forms of diarrhœa.
Flannel binder, 273. Round the belly in infantile diarrhœa.
Injections, 99. Of starch water at 100 degrees Fah., with laudanum and acetate of lead or sulphate of copper. Invaluable in urgent cases such as the choleraic diarrhœa of children, also in diarrhœa of phthisis and of typhoid.
Injections of cold water, 74. In chronic diarrhœa.
Ipecacuanha, 412. Hourly drop doses of the wine, especially if vomiting be present, in dysenteric diarrhœa of children.
Iron, 232. Astringent preparations, especially the pernitrate.
Lead, 244, 245. A few grs. of the acetate with a small dose of morphia, a sure and speedy remedy for summer diarrhœa; the acetate with opium in purging of cholera and that due to dysentery, typhoid, or tubercular disease of intestines.
It increases the efficacy of a starch injection.
It may be used as a suppository.
Lime, carbonate of, 204. In the later stages when the irritant got rid of. As chalk mixture in diarrhœa from more serious causes, as typhoid or phthisis.
Lime-water, 202, 203. In chronic vomiting with diarrhœa in young children.
Mercury, 3. Generally best when stools are light-coloured. Nitric acid and nux vomica assists its action.
For indications afforded by condition of tongue, see p. 3.
—— 269. A third of a grain of grey powder every hour or two in diarrhœa of children with bad digestion, flatulent distension and clayey stinking motions.
—— 270. Where children or adults suffer from acute or chronic diarrhœa with slimy, perhaps bloody stools and pain and straining, give frequent teaspoonful doses of a solution of one grain of bichloride in ten ozs. of water.
Grey powder, a sixth of a grain hourly, then every two or three hours in infantile

DIARRHŒA—*continued.*

diarrhœa with watery and offensive, muddy or green stools to the number of ten or twelve a day—vomiting is an additional indication for this treatment.

In all cases of infantile diarrhœa little food should be given, but frequently.

When children pass large, acid, offensive, curdy stools, mercury of little use—here milk should be entirely withheld.

— 273. The chronic diarrhœa of adults with watery, pale stools, often yields to the hundredth of a grain of corrosive sublimate every two or three hours; this may be employed in diarrhœa of typhoid, or phthisis.

Morphia, 565. In choleraic diarrhœa of children.

βNaphthol, 625.

Nitric acid, 3. With nux vomica to assist action of mercury or podophyllin.

— 166. For straining diarrhœa of children when motions green, curdled, and mixed with mucus; also in chronic diseases of children with sour-smelling, pale, and pasty motions, especially if acid combined with pepsin.

Opium, 556. Or morphia in acute forms after expulsion of offending matter, also in chronic diarrhœa of tuberculosis, dysentery, and other organic diseases. In typhoid fever, where there is wakefulness, delirium and diarrhœa, it will often subdue the symptoms.

— 557. In dyspepsia with diarrhœa, common in children, where there is sinking at the stomach, relieved for a short time by food, and the occurrence of an evacuation of partially digested food immediately after the meal. Two to five drops tr. opii a few minutes before each meal very efficacious, but arsenic even more so.

— 557, 558. An injection with starch in acute and chronic diarrhœas, including those severe forms which sometimes carry off young children in a few hours. Also in typhoid tubercular ulceration of intestines and dysentery.

Phosphate of lime, 207. In chronic diarrhœa, tubercular or otherwise.

— 208. In chronic diarrhœa, especially that of young children, may be given with carbonate of lime and lactate of iron.

Podophyllum, 461. In chronic diarrhœa with high-coloured motions and cutting pains; also in morning diarrhœa; also in chronic diarrhœa with watery, pale, frothy motions, with severe cutting pain. (*See also* p. 3.)

Raw meat diet, 673, 674. For children and adults.

Rhubarb, 635. In early stages to get rid of irritant, and afterwards to check the diarrhœa.

Salicylate, subgallate of bismuth, 242. And other bismuth compounds.

Salicylic acid, 614. As an injection in dysenteric diarrhœa of children.

Silver, nitrate of, 254. In acute and chronic diarrhœa.

Spinal ice-bag, 91, 92. For cramps. Also when due to excessive action of mucous membrane.

Sulphuric acid, 165, 166. In summer and choleraic diarrhœa. Small doses in chronic diarrhœa, also in the diarrhœa of hectic.

Tannin, 340. As catechu, kino, red gum, rhatany and hæmatoxylum in acute and chronic diarrhœa, internally or as injections.

Veratrum album, 453. Has been used with advantage in the vomiting and purging of summer diarrhœa.

Wet pack, 57. Daily in chronic diarrhœa, due to chronic catarrh of intestines.

Zinc, oxide of, 281. Two to four gr. doses every three hours in diarrhœa of children.

DIGESTION, WEAK. (*See* DYSPEPSIA.)

DIPHTHERIA. (*See* THROAT, DISEASES OF.)

Antitoxic serum, 647.

Bichloride of mercury, 276.

Boracic acid, 174. In glycerine as local application, frequent application of.

Chloral, 385. Applied locally.

Chlorate of potash, 222. In dryness of throat after.

Chlorinated soda, 130. Strong solution to throat.

Chlorine solution, 130, 131. For sloughing of throat. Also internally.

Eucalyptus oil, 426. To the throat and as inhalation.

Glycerine of carbolic acid, 350. (See *also foot note.*)

Hydrochloric acid, 162. Locally.

Ice, 89. To be sucked, especially at commencement, and continued constantly till disease declines.

Ice poultice, 89. To throat, especially when glands threaten to suppurate.

Iodine, 135. As inhalation. (For formula see ref.)

Iron, 236. Large doses of perchloride—solution better than tincture—every hour or oftener. Solution also to be gently painted on throat or applied with atomizer.

Lactic acid, 162. ʒss. to ʒj. in ℥j. of water as spray or application to membrane every hour.

Lime, 202. Solution as spray. Recommended by many, but of doubtful efficacy.

Permanganate, 238. Has been given internally.

Pilocarpine, 513.

Quinia, 604. As strong solution of spray topically.

Silver nitrate, 253. Of doubtful benefit.

Sodium bicarbonate, 176. Solution as spray of.

Strychnia, 576. Hypodermically for paralysis after diphtheria. In cardiac failure, 577.

Sulphur blown or dusted on to the diseased surface, 121.

Sulphurous acid, 171, 172.

Tannin, 339. As spray (5 per cent. solution).

DIPSOMANIA.

Arsenic, 291. For distressing vomiting—one drop of liq. arsen. before breakfast.

Capsicum, 433. Large doses before meals, and whenever depression and craving for alcohol occurs. With bromide or arsenic and bitters to assist in overcoming habit.

DROPSIES.

Nature and causes of, see pp. 39, 43.

Mode of action of remedies, pp. 42, 43.

Acupuncture, 104. Or, better still, incisions from three-quarters to an inch long—one

DROPSIES—*continued.*

over each external malleolus generally sufficient. Keep a moist application containing carbolic acid to incisions, and put feet and ankles into hot bath for an hour night and morning. Not suitable if subcutaneous tissue hard and brawny.
ADONIDIN, 495.
ARSENIC, 298. For swelled feet from debility.
BITARTRATE OF POTASH, 217. Especially in general dropsies; useful in Bright's disease to prevent watery accumulations and to draw off effete matters.
CAFFEINE, 592.
CALOMEL, 275. Powerful diuretic in renal and cardiac dropsy, in the latter may be combined with digitalis and squill.
COLOCYNTH, 629. Has been used.
CONVALLARIA, 491. Used by Russian peasants.
COPAIBA, 423. In some cases of ascites and Bright's disease, and even in cardiac dropsy.
DIGITALIS, 485. The fresh infusion is best in heart disease.
ELATERIUM, 628. In kidney and heart disease: must be employed cautiously. (*See* ref.)
IODIDE OF POTASSIUM, 145, 146. In some cases of Bright's disease.
JALAP, 632. In combination with other substances, *e.g.* scammony.
JUNIPER, 424. Esteemed by some in scarlatinal dropsy.
SQUILL, 641. Recommended in all forms.
SPARTEINE, 493.
SULPHATES OF MAGNESIA, SODA, etc., 217. ʒij.–℥j. in ℥j. water before food.
Hay's method of using, 217.
THEOBROMINE, 595. In particular the sodio-salicylate, "Diuretin."

DYSENTERY.

ALUM, 228. For the diarrhœa.
ARSENIC, 292. (*See* DIARRHŒA.)
COCAINE, 603. As anal injection for straining.
HAMAMELIS, 341. When discharges contain much blood.
INJECTIONS, 100. A pint of water with ten to twenty grains of sulphate of copper, etc., in the diarrhœa of chronic dysentery.
Large emollient enemata useful in early stages of dysentery.
INJECTIONS OF COLD WATER, 74. In chronic dysentery.
IPECACUANHA, 442. Large doses required. The dysenteric diarrhœa of children will often yield to hourly drop doses of ipecacuanha wine, especially if vomiting present.
LEAD, 245. The acetate with opium for purging.
MERCURY, 270. A hundredth of a grain hourly or every two hours of the bichloride in acute or chronic dysentery, if stools are slimy and bloody.
βNAPHTHOL, 625.
OPIUM, 558. For the purging.
SILVER NITRATE, 254. Injections of.

DYSMENORRHŒA.

ACTÆA, 465.
ANTIPYRIN, 622.
APIOL, 424.
ARSENIC, 292. When accompanied by copious discharge of membranous shreds from bowels and uterus.

DYSMENORRHŒA—*continued.*

CAJEPUT, 424.
CANNABIS INDICA, 585. Very useful.
CASTOREUM, 429.
CROTON CHLORAL, 391. In dysmenorrhœal neuralgia.
GELSEMIUM, 523. Said to be useful.
GUAIACUM, 463. In rheumatic or neuralgic dysmenorrhœa.
HAMAMELIS, 342. Often relieves pain.
HOT SITZ-BATH, 67. Two or three times a day.
HYDRASTIS, 590.
NITRITE OF AMYL, 407. Inhalation.

DYSPEPSIA. (*See also* ACIDITY.)

ACIDS, especially hydrochloric, after a meal if deficient supply of gastric juice, sometimes useful before meals, 163.
ACTÆA, 465. For the dyspepsia of drunkards.
ALCOHOL, 354. In loss of appetite and digestive power from fatigue, a glass of wine or a little brandy and water before food; useful also in indigestion during convalescence from acute diseases or in town dwellers. During acute disease alcohol should be given with food, little and often, 363.
ALKALIES, 159, 163. Shortly before a meal increase gastric juice, *usually* better than acids in atonic dyspepsia. (*See also* p. 149.)
—— 182. Bicarbonate of soda best.
ALOES, 630. In combination, for habitual constipation with dyspepsia.
The compound decoction a good after-dinner laxative. One grain of the watery extract with nux vomica, gentian or cinchona, a good dinner pill.
ARSENIC, 5. Indicated by a too clean, too smooth red tongue with prominent papillæ.
—— 291. One drop of liq. arsen. before food in irritative dyspepsia and dyspepsia in which diarrhœa is excited by food.
BELLADONNA, 531. One-sixth to one-fourth of the extract once a day when there is constipation.
BICHROMATE OF POTASSIUM, 224. Administered fasting.
BISMUTH, 240. Mixed with vegetable charcoal in flatulent dyspepsia.
BITTERS, 626, 627. Various forms of dyspepsia.
CARBOLIC ACID, 352.
CARLSBAD WATERS, 215, 216.
CHARCOAL, 114. Where there is flatulence. (*See* ref.)
COCAINE, 603. In nervous dyspepsia ¼ gr. three or four times a day.
COD-LIVER OIL, 326. In the "craving" at the epigastrium of the aged if intestinal canal not in an irritable condition.
COLCHICUM, 458. In gouty subjects.
COLD WATER, 94. Half a tumbler half an hour before breakfast.
CREASOTE, 345. Often relieves stomach pains occurring after food.
DIET, 667–669. See especially Salisbury's diet.
DRINKING LITTLE AND ONLY SOME TIME AFTER MEALS, 94. In "indigestion of fluids." (*See* ref.)
EUCALYPTUS, 426. In atonic form.
HOT WATER, 95. A tumbler twice or thrice daily between meals in flatulent and acid dyspepsia.
HYDROCHLORIC ACID, 163. Dilute, after a meal.
IPECACUANHA, 438. In irritative dyspepsia, acute and chronic, 441. When associated

DYSPEPSIA—*continued.*

with constipation, depression, and food lying on the stomach "like a heavy weight."
MALTINE, 684-686. In amylaceous dyspepsia. Valuable in the digestive troubles of infancy, 686.
MANGANESE, 238. As permanganate where flatulence.
MERCURY, 3. As grey powder if constipation with light coloured stools. Nitric acid and nux vomica may be given simultaneously.
For remarks on indications of the tongue, *see* p. 3.
— 273. A grain of grey powder three or four times a day in dyspepsia occurring during chronic disease or in convalescence.
— 273. If constipation, half a grain of calomel with three grains extract hyosc. in pill for three nights is better.
MINERAL ACIDS, 163, 164. For eructations of offensive gas with or without oxaluria.
MORPHIA, 564. Hypodermically, when dyspepsia of an irritable kind in an irritable subject.
NUX VOMICA, 572. Where flatulence, weight on head and heartburn.
OPIUM, 557. When sinking at stomach relieved temporarily only by food which produces an evacuation almost immediately of partially digested matters, common in children, two to five drops of tr. opii a few minutes before meals very useful,—arsenic even more so.
— 566. In nervous people with weight on head, flushings, perspirations, and depression. A drop of laudanum with two of tr. nucis vom. three or four times a day.
In phthisis, not febrile.
PANCREATIN, 686.
PAPAIN, 688.
PEPSIN, 686.
PODOPHYLLUM, 460. Useful when tongue furred, especially if stools dark. This holds good whether bowels open or constipated, but in latter case 1-30th to 1-20th grain doses only. A mixture containing nux vomica and nitric acid should be given at the same time. If disagreeable taste persists, rinse the mouth with solution of permanganate of potash.
— 460. For cankery taste, especially in the morning. If this fail, try mercury.
QUINIA, 604, 605. Especially in elderly people living in towns. Checks excessive fermentation in the alimentary canal.
SENNA, 636. Combined with gentian when there is constipation.
SULPHO-CARBOLATE OF SODA, 352. And carbolic acid both useful in flatulence, especially when it occurs immediately after a meal or gives rise to "spasms."
TANNIN, 339. In irritative dyspepsia.
TURKISH BATH, 76. For slight indigestion and malaise after dining out.

DYSPHAGIA.

COCAINE, 600. Painted over pharynx.

DYSPNŒA.

CHLORAL, 382.
CHLOROFORM, 375. In various forms of dyspnœa.
COCAINE, 602. Internally when due to weakened respiratory action.
GRINDELIA, 523. In spasmodic dyspnœa.
LOBELIA, 582. In emphysema.

DYSPNŒA—*continued.*

MORPHIA, 564. In dyspnœa from disease of heart and vessels.
NITRITE OF AMYL, 402. In cardiac dyspnœa.
STROPHANTHUS, 493. In cardiac dyspnœa, in like manner to digitalis.

EAR DISEASES. (*See also* OTORRHŒA *and* DEAFNESS.)

ACONITE, 475. In otitis.
COCAINE, 600. As spray in otalgia. (*See ref.*)
COUNTER-IRRITATION, 110. By blistering fluid or croton oil liniment behind the ear often relieves ear-ache.
GLYCERINE, 332. For dryness of meatus and as a film to cover the tympanum when ruptured.
STRYCHNIA, 577. Hypodermically.

ECTHYMA.

QUININE, 611. For mal-nutrition on which the ecthyma depends.

ECZEMA.

ALKALINE BATHS, 178.
ALKALINE LOTION, 159. Weak, often useful in weeping eczema.
ALUM, 225. Applied to check profuse discharge, but usually insufficient to heal of itself.
ARSENIC, 305, 306. In chronic forms, especially of vulva, anus, and scrotum. Largest dose five min. of liq. arsenicalis three times a day, never on an empty stomach. For rules to be observed in giving arsenic *see* ref.
BENZOIN, 422. The compound tincture painted on the skin to allay itching.
BISMUTH, 240. Nitrate or carbonate, as dusting powder, but generally greasy applications preferable. Subgallate of bismuth (Dermatol), 242.
BLISTERS, 110. Especially in eczema of hands, applied around or near the disease.
BORACIC ACID, 82, 173, 174. As ointment or lotion in ecz. vulvæ, and mixed with starch as a dusting powder for infants.
— 173. A teaspoonful dissolved in a pint of boiling water as a lotion in eczema of the vulva.
BORAX, 177. As glycerine of borax in eczema of ears and scald-head.
CAMPHOR, 411. As addition to dusting powders to allay heat and itching.
CANTHARIDES, 435.
CARBONATE OF POTASH OR SODA, 176. A weak solution applied when raw surface weeps copiously. (*See* ref.)
CARBOLIC ACID, 349, 350. In chronic eczema, or, better still, liq. carbonis detergens, oil of cade, and oleum rusci. In the weeping stage if inflammation not great ten min. carbolic acid to one oz. of lard; also in eczema capitis. Sometimes tar better than its ointment; on the back of hands undiluted petroleum, but rather painful.
CARBOLIC ACID, 344. Petroleum, cade and carbolic soaps useful.
CAUSTIC POTASH, 177. As liquor potassæ locally in chronic eczema.
CINCHONA, 604. Powdered bark locally to check profuse secretion, probably cheaper preparations of tannin as useful.
COCAINE, 601. A lotion for scrotal eczema.
COD-LIVER OIL, 177. Or glycerine applied at night to obviate brittleness of skin when caustic lotions used.

ECZEMA—*continued.*

- **CYANIDE OF POTASSIUM**, 551. Or hydrocyanic acid. (*See* Itching.)
- **EUCALYPTOL**, 426. With iodoform and vaseline. Useful in dry stage.
- **GLYCERINE**, 177, 332. Or, better still, glycerine of starch for rough skin left after eczema.
- **GLYCERINE OF TANNIN**, 337. In most forms.
- **IODOFORM**, 397.
- **LEAD**, 242. Soluble salts as lotions when much inflammation and copious discharge.
  If great inflammation, surface to be covered constantly with rags soaked in the lotion. In some cases a poultice at night and lotion during the day. A strong lotion best in diffused eczema without weeping but with much itching. A weak alkaline or sulphur bath assists action of lotion. Equal parts of emp. plumb. and linseed oil applied on soft linen twice a day invaluable in sub-acute stage, 244.
- **LIME, CARBONATE OF**, 201. As dusting powder.
- **LIME-WATER**, 201. As sedative and to check discharge. After inflammation subdued lime-water and glycerine a comforting application.
- **MENTHOL**, 415. Ointment.
- **MERCURY**, 256, 257. Citrine ointment, especially when skin healed, very useful when eczema attacks hairy parts of face, sometimes well to mix it with tar ointment. Mercurial vapour bath, 258.
- **MILK**, 177. With water as local application.
- **OIL OF CADE**, 177. Equal parts soft soap, rectified spirit and oil of cade night and morn.
- **OILS AND FATS**, 320. To prevent irritation from the discharge, generally mixed with oxide of zinc.
  Simple oils facilitate the removal of scabs.
- **PARAFFIN AND VASELINE**, with boric acid, 174. For eczema.
- **PETROLEUM AND VASELINE**, 335. For chronic eczema.
- **POTATO POULTICE**, 87. Cold, sprinkled with powder composed of camphor, talc, and oxide of zinc, when much inflammation and sensation of heat, or the powder alone may be dusted over surface.
- **POULTICES**, 83. If skin is much inflamed.
- **SALICYLIC ACID**, 614. As lotion.
- **SILVER NITRATE**, 251. To be painted on limited patches, most serviceable after weeping stage.
- **SOAP**, 177. Moist, weeping surface to be washed with soap and water night and morn.
- **SULPHIDES**, 122. As baths, not in acute stage.
- **SULPHUR**, 121. Internally.
- **TAR**, 343, 347. In treacle, pills, or capsules, from three to fifteen min. for a dose in chronic eczema.
- **TARTAR EMETIC**, 286.
- **THYROID EXTRACT**, 661.
- **TURKISH BATH**, 76.
- **VASELINE**, 335. When skin dry and hard in chronic eczema.
- **WARM BATH**, 67. Especially in acute stages —rain-water best.
- **YOLK OF EGG**, 177. With water as local application.
- **ZINC**, 280. The ointment of the oxide as a mild stimulating application after inflammation subsided when raw surface indolent.
  Oxide and carbonate used as dusting powders, generally greasy applications better. (*See* p. 280.)

EMETICS, DEPRESSION FROM.

- **AMMONIA**, 195. Combined with other emetics to obviate depression.
- **CHAMOMILE**, 627. To assist action of emetics.

EMISSIONS. (*See* SPERMATORRHŒA.)

EMPHYSEMA. (*See also* BRONCHITIS.)

- **ARSENIC**, 298. For emphysematous persons who on catching cold are troubled with slight wheezing and some dyspnœa. If bronchitis or dyspnœa very severe, lobelia or belladonna better. Arsenic especially useful where this affection can be connected with the recession of a rash.
- **CHLORAL**, 382. For the shortness of breath brought on in emphysematous persons by catching cold. If obstructed circulation, caution required.
- **COD-LIVER OIL**, 326. Checks degeneration.
- **CUBEBS**, 424. ʒss. to ʒj. of tinct. thrice daily in linseed tea often cures cough "like a charm."
- **LOBELIA**, 582. Allays the dyspnœa which accompanies capillary bronchitis in emphysema.
- **PURGING**, 633. In obstruction of right heart.
- **STRYCHNIA**, 578.

EMPYEMA.

- **BORIC ACID**, 173. As wash.
- **CARBOLIC ACID**, 351. A weak solution to be injected after evacuation. (*See also foot-note.*)
- **CHLORINE SOLUTION**, 130. For washing out cavity.
- **IODINE**, 134. Solution to be injected after tapping.

ENDOCARDITIS. (*See also* HEART DISEASES.)

- **ANTISTREPTOCOCCIC SERUM**, 655.
- **CORROSIVE SUBLIMATE**, 277. In malignant form.

ENERGY, LACK OF.

- **TURKISH BATHS**, 76. Useful to town-dwellers, with soft, flabby tissues and mental depression.

ENURESIS. (*See* INCONTINENCE OF URINE.)

EPIDIDYMITIS.

- **OLEATE OF MERCURY AND MORPHIA**, 260. Locally—syphilitic or not.

EPILEPSY.

- **ARSENIC**, 309. Sometimes useful.
- **BELLADONNA**, 536. For method *see* ref.
- **BORAX**, 181.
- **BROMIDES**, 150, 151, 152. Bromides of potassium, sodium, ammonium, lithium, etc.; also combination of these with each other and with other sedatives.
- **CHLORAL HYDRATE**, 382. In status epilepticus.
- **COPPER**, 279. The salts have been given.

EPILEPSY—*continued.*

Musk, 429. Has been given.
Nitrite of amyl, 403, 404. As inhalation or in two to five min. doses in mucilage, especially where fits are very frequent.
Nitrite of sodium, 410. In ℈j. doses thrice daily.
Nitro-glycerine, 409. In epilepsy and the status epilepticus.
Silver, 255. Nitrate or oxide occasionally given with benefit.
Valerian, 427. Has been used with occasional advantage.
Zinc, 282. As oxide or sulphate—bromide of potassium better.

EPISTAXIS. (*See also* HÆMORRHAGE.)

Aconite, 475. Small and frequent doses often quickly check epistaxis in children and plethoric people.
Alum, 225. May be injected or snuffed up in powder.
Cocaine, 600. Locally in hæmorrhage from nasal mucous membrane.
Compression of facial artery, 449 (footnote).
Digitalis, 488. The infusion best.
Ergot, 587. Hypodermically if urgent in two to five grain doses. May also be given by the stomach.
Hamamelis, 341. (*See* Hæmorrhage.)
Hot foot-bath, 68. With or without mustard.
Ipecacuanha, 449.
Lead salts, 249.
Spinal hot-water bag, 92. To cervical and upper dorsal vertebræ.

EPITHELIOMA. (*See* CANCER.)

ERUCTATIONS, OFFENSIVE.

Mineral acids, 164. To correct the oxaluria on which the eructations depend.

ERYSIPELAS.

Aconite, 474. Administered at commencement, often at once cuts short the attack. Very useful in the erysipelatous inflammation following vaccination — belladonna ointment may likewise be used.
Ammonium carbonate, 196. In typhoid condition.
Antistreptococcic serum, 654, 655.
Belladonna, 537. Internally and externally may be used with aconite.
Carbolic acid, 350. Hypodermically. (*See* ref.)
—— 349. A one per cent. solution on lint frequently renewed relieves pain.
Collodion, 317. Painted over superficial erysipelas, but this often cracks and is inferior to a solution of nitrate of silver in water or in nitrous ether.
Digitalis, 488. Infusion locally and internally.
Hot Fomentations, 87. When limb extensively affected.
Iodine and other counter irritants, 110, 133. Paint affected and circumjacent skin with solution to prevent spreading.
Iron, 230. Tincture locally, especially in vaccinal form.
—— 236. Large doses of perchloride very frequently.
Permanganate, 238. Has been given internally.
ol, 619. As dusting powder with talc.

ERYSIPELAS—*continued.*

Silver, Nitrate of, 251. The skin to be well washed with soap and water, then with water, and to be wiped quite dry—next a solution of eighty grs. of the brittle stick to four drms. of water, to be applied two or three times to inflamed surface, extending two or three inches beyond it.
Sulphurous acid, 170. Equal parts of B.P. acid and glycerine.

EXHAUSTION.

Alcohol, 361, 362, etc. Rum and milk, 364.
Ammonia, 196. Internally its influence is but brief.
Blisters in prostration of fevers, with comatose state, 106. (*See* Fevers and Coma.)
Cocaine, 602. Internally in nervous exhaustion.
Coffee, 592. Or tea, both in hot and cold climates.
Digitalis, 485. In prostration of typhoid or pneumonia.
Ether, 377.
Orchitic extract, also spermine in nervous exhaustion, 665.
Phosphorus, 316. For physical and mental exhaustion. Influence questionable.
Sparteine, 494. In typhoid state.

EXOPHTHALMIC GOITRE. (*See* GOITRE.)

EYE, DISEASES OF. (*See also* CONJUNCTIVITIS.)

Atropia, 529. In iritis locally. Also to paralyze accommodation.
Belladonna, 529. Locally and internally in iritis, conjunctivitis, and other inflammations.
Blisters, 110. Behind ear or to temple in rheumatic, gouty and simple inflammation—blistering paper enough. Obstinate forms of tinea tarsia sometimes yield to flying blisters on the temple.
Castor oil, 330. Applied to allay pain from an irritant, as sand.
Chloroform, 365. Vapour of, close to a photophobic eye, relieves.
Cocaine, hydrochlorate, 598, 599. Instillation of a four per cent. solution as local anæsthetic in various operations, sometimes injection required. Discs are a useful form. The mydriatic effect may be neutralized by pilocarpine. Use of cocaine also in photophobia, *e.g.* from corneal ulcers, etc. Caution.
Eucaine, 603. As an anæsthetic in lieu of cocaine.
Iodide of potassium, 143.
Lead washes, 244. In conjunctivitis, beware corneal ulceration.
Mercury, bichloride of, 275. Of great service in iritis.
——**and morphia, oleate of**, 260. Outside the eyelids in palpebral conjunctivitis and hordeolum; also in syphilitic iritis.
Opium, 554.
Physostigmine, 503, 507. To contract pupil and lessen intra-ocular tension.
Strychnia, 577. Hypodermically in muscular asthenopia, amblyopia, tobacco amaurosis, and in progressive nerve atrophy not dependent on intra-cranial disease, also in traumatic amaurosis.

FACIAL PARALYSIS. (*See* PARALYSIS.)

FÆCES, HARDENED.

ENEMATA, 97. A tube may be passed through the mass. (*See* ref.)
EXTRACTION, 97. By fingers.

FAINTINGS.

ALCOHOL, 361. As brandy or wine when heart suddenly enfeebled from fright, etc.
AMMONIA, 195, 196. Breathed into the air-passages; taken internally; injected into veins.
CAMPHOR, 414. In collapse.
CHLOROFORM, 366. Internally, but effects more transient than those of alcohol;—often given to hysterical people.
COLD WATER, 47. Sprinkled on face.
ETHER, 377.
NITRITE OF AMYL, 402.
POSITION, 361. Patient should lean forward with the head as low as possible between the legs.

FATIGUE.

ACTÆA, 466. For headache from over-study or excessive fatigue.
ARNICA, 57. A few drops of tinct. internally for aching of muscles.
COFFEE, 592. And tea both in hot and cold climates.
COLD WATER, 55. Rubbing with wet towel.
DRIPPING WET COLD SHEET, 57. As a restorative and to prevent aching of muscles.
SITZ BATH, 55. At 60° to 80°.

FAVUS. (*See* TINEA.)

FEET, EXCESSIVE PERSPIRATION OF. (*See also* PERSPIRATION, EXCESSIVE.)

BELLADONNA, 528.
ZINC OLEATE, 281.

FEVER, CHRONIC.

This occurs in Abscess, Ague, Leucocythæmia Phthisis, Rheumatism, Syphilis; see under each heading, also p. 31.

FEVERS, ACUTE.

Condition of pulse, see pp. 6–20.
Condition of skin, see pp. 20, 21.
Remarks on temperature, with hints as to diagnosis, see pp. 21–31.
Condition of tongue, see pp. 2–6.
ACETATE AND CITRATE OF AMMONIA, 197. Is a good diaphoretic, and is especially useful in the milder forms, as in common catarrh. Also the carbonate.
ACID DRINKS, 92, 93, 162. Such as raspberry vinegar, citric, or tartaric acid. (*See also* p. 167.)
ACONITE, 20. In small often repeated doses while temperature high and skin hot and dry—most successful when no lung complication. Where there is, tartar-emetic better.
—— 469. Has a marvellous power of controlling inflammation and subduing fever.

FEVERS, ACUTE—*continued.*

ALCOHOL, 4. When nervous depression, indicated by dry tongue, delirium, and sleeplessness. When wakefulness is the cause, it is better to try soporifics first.
—— 9. When pulse shows cardiac weakness. Effect on pulse to be watched.
—— 21. May be indicated by profuse sweating at commencement. (*See* ref.)
—— 361. When tongue and skin become moist, the breathing more tranquil, and sleep gained under its use. For rules *see* ref. (*See also* p. 363.)
ALKALIES, 190. Citrates and acetates are considered as febrifuge. They possibly eliminate urinary waters.
AMMONIUM CARBONATE, 196. In typhoid conditions of all fevers. Also given through whole course of scarlatina and measles. (*See* ref.)
ANTIFEBRINE, 623.
ANTIMONY, 286–288. Tartar-emetic wine as a diaphoretic; large doses are given by some to cut short acute specific fevers and inflammations. Ague may sometimes be cured by antimony, and this often assists quinine in curing it, 288. Ipecacuanha and other emetics should be preferred.
—— 288. When much excitement and delirium, tartar-emetic in full, with opium in small doses, but if wakefulness predominates, with not very boisterous delirium, the antimony to be reduced, and the opium increased.
ANTIPYRINE, 621. To reduce temperature.
ARSENIC, 298. Sometimes given in prostrating acute fevers to strengthen pulse and invigorate patient.
BELLADONNA, 537. In delirium.
BITTERS, 162. As orange-peel or cascarilla mixed with acid drinks to quench thirst.
BLISTERS, 106. Flying, or mustard poultices in the semi-comatose state sometimes following fevers, etc.
CAMPHOR, 413. In adynamic fevers and where there is delirium.
CARBOLIC ACID, 349; as disinfectant. As an anti-pyretic, 352.
CASTOR OIL, 330. As purgative.
CHLORAL, 381.
COLD AFFUSION, 60. At the beginning of acute fevers.
—— 73. Applied gently over forehead for headache.
COLD BATHS, 59–65. Employed early diminish frequency of pulse, strengthen heart, prevent delirium, produce sleep, lessen risk of bed-sores or exhausting suppuration. The only remedy in hyperpyrexia (*see* pp. 62, 63). Presence of bronchitis or pneumonia or hypostatic congestion does not contra-indicate cold water treatment, p. 64.
COLD DOUCHE, 73. In insomnia.
COLD PACKING, 56. In specific fevers and acute inflammatory diseases—especially useful on retrocession of the rash; pack cold or tepid.
CONIUM, 499. Has been recommended, as it reduces the frequency of the pulse.
DIGITALIS, 488. Large doses often required to reduce temperature, much used in fevers on the Continent, especially recommended in typhoid.
ETHER, 377. For prostration from fever.
EUCALYPTUS, 426. In intermittent, but inferior to quinine.
GLYCERINE, 332. For keeping moist the lips, tongue and gums when dry, and coated with mucus in acute diseases.
HOT AFFUSION, 74. Over forehead for h ache, sometimes better than cold.

FEVERS, ACUTE—*continued.*

ICE, 89. To be sucked for allaying thirst.
ICE-BAG, 74. To forehead for headache.
MUSK, 429. And castoreum have been given in fevers to prevent prostration. With laudanum in acute specific fevers.
MUSTARD, 430. As bath on recession of the rash of an eruptive fever.
NARCOTICS, 4. Chloral, bromide of potassium or opium where nervous depression, indicated by dry tongue, or delirium with sleeplessness.
OPIUM, 381, with or without chloral, 561. For delirium, either noisy or muttering with picking of bed-clothes. If furious, tartar-emetic should be combined with the opium. Morphia hypodermically is often the best way of administering an opiate. In extreme weakness with sleeplessness, and brown, dry tongue, laudanum helps a patient over the critical stage with less alcohol than would otherwise have been required.
PHENACETIN, 623.
PHOSPHATE OF LIME, 207. In hectic.
QUININE, 610. Especially in typhoid, but little used as anti-pyretic except in rheumatic fever.
SALICYLIC ACID AND SALICYLATE OF SODA, 616. In large (one drachm) doses every night, or in smaller and more frequent doses, reduce temperature in most febrile diseases, especially in rheumatic fever.
SALINE PURGATIVES, 217, 218.
STRYCHNIA, 577. Hypodermically.
SULPHATE OF MAGNESIA, 217. Or phosphate of soda as purgative. (*See* ref.)
TARTAR EMETIC, 286. Wine as diaphoretic in fevers.
VERATRUM VIRIDE, 452. Has been employed.
WARM BATH OR WARM SPONGING, 66. In simple or inflammatory fever of children, and in some of the febrile diseases of adults.

FISSURE OF ANUS.

BELLADONNA, 525. The extract locally.
BICHROMATE OF POTASSIUM, 224.
BROMIDE OF POTASSIUM, 148. In five parts of glycerine as local application in fissures of rectum.
CASTOR OIL, 330. In fissure of anus.
CONIUM, 498.
ICE, 89. As a local application to remove pain after operation.
OPIUM, 558. With gall ointment for fissures of anus. Mild purgatives should be simultaneously employed.
SULPHUR, 119. As a mild purgative to cause soft motions.

FLATULENCE. (*See also* ERUCTATIONS.)

ABSTENTION FROM SUGAR AND STARCHY FOOD, 115. Also from tea.
AMMONIA, 195. In alkaline preparations for flatulent distension of stomach and intestines (palliative).
ASSAFŒTIDA, 428. When unconnected with constipation or diarrhœa—useful for children,—one drachm of a mixture of one drachm of the tinct. to half a pint of water. Also in hysterical flatulence, 115.
BISMUTH, 115 and 240. Mixed with charcoal in flatulent dyspepsia.
BITTERS, BOTH PURE AND AROMATIC, 627.
CALABAR BEAN, 506. At change of life.
CAMPHOR, 412.
CAPSICUM, 434.

FLATULENCE—*continued.*

CARBOLIC ACID, 114, 352. Most successful when no acidity.
CARLSBAD WATER, 216. Where acidity, constipation and pain at epigastrium, over liver or between shoulders, with sallow complexion and jaundiced conjunctivæ.
CHARCOAL, 113, 114, 241. Five or ten grs. soon after meal, if wind half-hour or more after, but just before meal if wind formed during or immediately after it. Obviates both wind and acidity.
CHLOROFORM, 366. Drop doses, pure.
ESSENTIAL OILS, 422. Especially of cajeput and cloves, or spirit of horse-radish.
ETHER, 377.
EUCALYPTOL, 426. In change of life.
GLYCERINE, 333. In tea or coffee with food.
HOT-WATER, 95. A tumbler between meals.
IPECACUANHA, 439, 440. Especially in pregnancy.
MERCURY, 269. Half a grain three times a day when flatulence accompanied by clayey stools.
NUX VOMICA, 572. When constipation, heartburn and weight on head.
SULPHO-CARBOLATES, 114, 352. Most successful when no acidity.
SULPHO-CARBOLATE OF SODA, 352. Or carbolic acid in flatulence occurring immediately after meals, also when accompanied by "spasms."
SULPHUROUS ACID, 171. In five to ten min. doses when produced by fermentation.
TURPENTINE OR ASSAFŒTIDA, 99, 418. One or two tablespoonfuls of turpentine well mixed in injection, in intestinal flatulence.

FLOODING. (*See* MENORRHAGIA.)

FLUSHING HEATS.

BROMIDE OF POTASSIUM, 153. Where mental depression at change of life.
EUCALYPTOL, 426. In change of life.
NITRITE OF AMYL, 405. A tenth to a sixth of a minim in thirty times its volume of rectified spirit.
NUX VOMICA, 577. The tinct. combined with small quantities of laudanum in so-called hysteria of middle-aged people with flatulence, weight on head and perspirations.
VALERIANATE OF ZINC, 426. At change of life. Some prefer valerian or its tincture.

GALL-STONES.

CARLSBAD WATERS, 215. A system required. (*See* ref.)
CHLORAL, 383. Sometimes relieves the pain.
CHLOROFORM, 375. Internally.
GELSEMIUM, 522. Five drops of the tincture every quarter of an hour. Relief quicker if patient walks about.
PHOSPHATE OF SODA, 217. To prevent formation.
SODA, CARBONATE OF, 522. A teaspoonful in a tumbler or two of hot water.

GANGRENE.

CARBOLIC ACID, 351. Locally.
CHARCOAL, 113. Poultices,—efficacy doubtful.
CREASOTE OR CARBOLIC ACID, 344, 347. In gangrene of lung as inhalation.
IODOFORM, 396.
IODOL, 398.

GASTRALGIA, GASTRODYNIA AND GASTRITIS. (*See* STOMACH, DISEASES OF.)

GASTRIC ULCER. (*See* STOMACH, DISEASES OF.)

GIDDINESS.

COD-LIVER OIL, 326. In giddiness of the aged when no serious brain disease.

GLANDERS.

MALLEIN, 651.

GLANDS, ENLARGED.

BLISTERS, 110. Or iodine, 124.
CHLORIDE OF CALCIUM, 205.
IODIDE OF POTASSIUM, 139. As ointment.
——144. For mamma and testicle, but especially for thyroid.
IODINE, 133. Applied externally, also tincture injected into gland itself.
MERCURY AND MORPHIA, OLEATE OF, 260. In obstinate and painful tonsilitis and inflammation of lymphatic glands.
SOFT-SOAP, 182. Applications in both scrofulous and non-scrofulous and syphilitic enlargements. Also in scrofulous mesenteric disease.
SULPHIDE OF CALCIUM, 128. For hard, swollen glands behind angle of jaw with deep-seated suppuration, strumous, *i.e.*, tuberculous.

GLAUCOMA. (*See* EYE, DISEASES OF.)

GLEET.

BISMUTH, 241. (*See* Gonorrhœa).
BLISTER, 110. To perinæum in obstinate gleet.
CANTHARIDES, 435. Drop doses.
COPAIBA, 423. And cubebs.
COPPER, 278. Solution of the sulphate as injection.
EUCALYPTOL, 425. In chronic catarrh of passage.
GLYCERINE OF TANNIN, 337. With an equal quantity of olive oil or mucilage as injection—two drachms of this mixt. enough. Persevere eight or ten days after discharge ceased, and do not use at bedtime.
IRON, 230. (*See* Gonorrhœa.)
LEAD, 244. (*See* Gonorrhœa.)
LIME-WATER, 202. As injection.
OIL OF SANDAL WOOD, 423. Fifteen minims three times a day.
TURPENTINE, 419.
MERCURY, 262. Half a grain bichloride of mercury in water.
ZINC, 280. The sulphate or chloride as injection.

GOITRE.

BELLADONNA, 535. Five min. of the tinct. hourly, of great service in exophthalmic goitre. Also in tachycardia.
IODIDE OF POTASSIUM, 139, 144. Internally and externally in hypertrophy of thyroid.
IODINE, 134. Tinct. hypodermically into the gland itself.
—— 132. Liniment applied as often as state of skin will permit.

GOITRE—*continued.*

MERCURY, BINIODIDE OF, 261. As ointment assisted by sun's rays, remarkably useful in India. (*See* p. 238).
SPARTEINE, 494. In exophthalmic goitre.
SUPRARENAL EXTRACT, 663.
THYROID EXTRACT, 660. In exophthalmic goitre (Graves' disease).
THYMUS GLAND, 661.

GONORRHŒA.

ACONITE, 475. A drop of the tinct. each hour in acute stage.
ALKALIES, 190. As citrates or bicarbonates to make urine alkaline.
AVOIDANCE OF ALCOHOL, 364. Very important.
BISMUTH, 241. Half an ounce with equal weight of glycerine and three ounces water, useful as injection in chronic stage.
BLISTERING, 111. A flying blister every night for gonorrhœal rheumatism.
CANNABIS INDICA, 584. Occasionally useful.
CANTHARIDES, 435. Drop doses.
CARBOLIC ACID, 351.
COCAINE, 601. Injection of a few drops of two per cent. solution. (*See* ref.)
Tampons soaked in cocaine relieve pain of blenorrhœa.
COPAIBA, 423. Best in chronic form.
COPPER, SULPHATE OF, 278. Solutions are employed as injections.
CUBEBS, 423. In large doses at commencement.
GLYCERINE OF TANNIN, 337. One drachm with equal quantity of olive oil or mucilage, as injection in after stages. Persevere eight or ten days after discharge ceases. Do not use any urethral injection at bedtime.
HYDRASTIS, 590.
IRON, 230. Tinct. perchlor. half a drachm, tinct. opii one drachm to a pint of water as injection, or ferr. sulph. gr. xii. tinct. opii half oz. to 8 ozs. of water to be used three times a day.
LEAD, 244. As injection sometimes employed.
OIL OF SANDAL WOOD, 423. Fifteen min. three times a day in acute and chronic gonorrhœa.
PAREIRA, 628.
SILVER, NITRATE OF, 251. An injection of twenty grs. to the oz. said to cut short the attack—or one of one or two grs. to the oz. may be used several times a day.
Probably tannin is better both for gonorrhœa and gleet.
SULPHO-CARBOLATE OF ZINC, 351. Twenty grs. to eight ozs. of water as injection two or three times a day.
TURPENTINE, 419.
ZINC, 230. A grain or two of chloride in a pint of water injected hourly often removes the disease in twenty-four to forty-eight hours if used at the commencement. Rest should be observed if possible. If the frequent injection causes pain in testicles, suspend them in hot water and foment them frequently—if notwithstanding, the pain and swelling increase, use injection less often.
Also Zinc Sulphate.

GOUT.

ACONITE, 474. For gouty pains.
ALKALIES, especially potassium and lithium salts, 185.
ALKALINE BATHS, 178.

GOUT—*continued.*

Alkaline poultices, 88. Nine parts linseed meal to one bicarbonate of soda.
Antipyrine, 622. Hypodermically in acute gout.
Blisters, 111. A flying blister every night in chronic or subacute gout.
Brine baths, 68. At Droitwich very useful. Also brine baths at home.
Carbonate of lithia, 181. Five grs. to the oz. on lint applied round gouty enlargements and joints, especially if skin broken.
Carbonic acid waters, 115. Used externally.
Carlsbad waters, 215, 216. A system required. (*See* ref.)
Citrate of lithia or of potash, 181. Used in same way as the carbonate of lithia when skin broken.
Cod-liver oil, 326. In chronic gout.
Colchicum, 456. A drachm of the wine often removes the severest pain in an hour or two.
—— 458. Useful in bronchitis, asthma, urticaria, dyspepsia, etc., occurring in gouty persons.
Collodion, 318. The contractile variety with or without iodine, painted over inflamed part in acute gout, soon relieves the pain. Too many coats must not be applied.
Diet, Salisbury, 668, 669.
Guaiacum, 463.
Iodide of potassium, 145. Especially when pain worse at night.
Iodine, 132. Painted round joints in chronic gout.
Iodoform, 397.
Oil of peppermint, 421. To be painted on painful part.
Packing, 57.
Piperazine, 665.
Serpentary, 464, 627.
Sulphides, 122. As baths in chronic gout.
Sulphurous acid, 171. After fumigation, patient to be covered with bed-clothes which have been exposed to strong fumes, this produces perspiration, sleep, and relief.
Turkish baths, 78. In subacute and chronic gout.
Hot followed by cold sponging may be useful as a substitute.
Veratria, 455. A strong ointment to painful joints at onset.

GRAVEL. (*See also* CALCULI.)
Piperazine, 665.

GRAVES' DISEASE. (*See* GOITRE.)

GUMS, PAINFUL AFFECTIONS OF.
Cocaine, 601.

HÆMATEMESIS. (*See also* HÆMORRHAGE.)

Alum, 227. Other astringents better.
Ergot, 587. (*See* Hæmorrhage.)
Hamamelis, 341. (*See* Hæmorrhage.)
Ice, 89. To be sucked.
Iron, 231, 232. The astringent preparation.
Lead, 244. Soluble compounds sometimes used.
Sulphuric acid, 165. Other astringents surer.
annin or gallic acid, 339.
rpentine, 417. In five to ten drop doses ery frequently.

HÆMATURIA.

Camphor, 435. Two to five grains when bloody, coagulable urine due to oil of mustard, turpentine, copaiba, or cantharides.
Cannabis indica, 584. Said to relieve dysuria and strangury. Bloody urine considered by some to be a special indication for its use.
Hamamelis, 341.
Lead salts, 249.
Parreira brava, 628.
Quinine, 611. Useful in some cases of intermittent hæmaturia.
Tannin or gallic acid, 340.
Turpentine, 419. In very small doses.

HÆOMPHILIA.

Hamamelis, 341.
Lime salts, 200.

HÆMOPTYSIS. (*See also* HÆMORRHAGE.)

Common salt, 211. Half a teaspoonful taken dry and repeated occasionally, till nausea induced.
Digitalis, 488. The infusion in large doses very useful.
Ergot, 587. Thirty or forty min. of the liquid ext. every three or four hours or hourly in severe cases. Ergotine should be used hypodermically in very urgent hæmorrhage, in two to five gr. doses.
Hamamelis, 341. (*See* Hæmorrhage.)
Ice, 90. Applied locally.
—— 91. Intermittent, use of.
—— 89. To be sucked.
Ipecacuanha, 449.
Iron, 237. (*See* Hæmorrhage.)
Lead salts, 249.
Morphia, 565. Small doses hypodermically have been employed successfully.
Saline purgatives, 218.
Spinal hot-water bag, 92. To cervical and upper dorsal vertebræ.
Sulphuric acid, 168. Supposed to be useful.
Tannin or gallic acid, 340.
Turpentine, 419. In drachm doses every three hours. This may, however, cause unpleasant symptoms.

HÆMORRHAGE.

Acids, 161. Diluted vinegar and other acids to leech bites, piles, cuts, etc.
Alcohol, 361. Brandy or wine when heart suddenly enfeebled by hæmorrhage.
Alum, 225. In slight hæmorrhages, as leech bites or piles, it may be dusted on after wiping dry.
—— 227. Will often check bleeding from stomach; other astringents better. Doubtful value as a remote astringent, 229.
Blood, 674. Fresh for prostration.
Carbolic acid, 349.
Cocaine, 602. Use of in a case of hæmophilia.
Copper, sulphate of, 277. In stick, solution, or ointment, to arrest bleeding from small vessels.
Creasote, 349. Or carbolic acid.
Digitalis, 488. The infusion best—large doses may be needed.
Ergot, 587. Most valuable for hæmoptysis, epistaxis, hæmatemesis and intestinal hæmorrhage in typhoid fever. In urgent cases ergotine should be administered hypodermically in from two to five gr.

HÆMORRHAGE—*continued.*

doses. In less urgent cases it may be given by the stomach.
Ether, 377. Hypodermically in heart failure from hæmorrhage.
Hamamelis, 341. In hæmoptysis, hæmatemesis, hæmaturia, epistaxis, bleeding piles, varicocele, and the oozing of blood persisting after a confinement.
Hydrastis, 589. In uterine hæmorrhage.
Ice, 88, 89. In hæmorrhage generally applied locally; also when from stomach, throat, or mouth small pieces to be swallowed. (*See also* p. 90.)
Ipecacuanha, 449. In flooding after delivery.
Iron, 229, 230. The sulphate and ferric chloride solid or in solution. The chloride controls bleeding from small vessels, but irritates the surface of wounds, and prevents union by first intention, which carbolic acid does not.
—— 230. Spray of subsulphate or insufflation of powdered sulphate in bleeding from nose or lungs.
—— 232. Astringent preparations in hæmorrhage of stomach.
—— 237. In hæmorrhage from lungs and kidneys the acetate is best; add sufficient water to make it taste, but not disagreeably, and let patient constantly sip this.
—— 230. Injection of perchloride in post-partum hæmorrhage.
Lead, 243. The liquor may be used to check hæmorrhage from small vessels; other astringents better.
Lime salts, 200.
Opium, 568. Tr. of opium in a large dose (one drachm) with brandy in profuse flooding after parturition.
Quinine, 611. In passive bleeding.
Saline transfusion, 205.
Silver, nitrate of, 250. Bleeding leech bites may be touched with a stick of caustic.
Spinal hot-water bag, 92. Apply to cervical and upper dorsal vertebræ for epistaxis or hæmoptysis.
Sulphuric acid, 165. In bleeding from stomach.
—— 168. Supposed to check hæmorrhage from lungs or womb.
Suprarenal extract, 663.
Tannin, 339, 340. In hæmorrhage from stomach, lungs, uterus, and kidneys.
Transfusion, 205. Of saline fluid.
Turpentine, 419. A drachm every three hours when from lungs, nose, uterus, or bladder. If from kidneys, much smaller quantities must be given.
Reported to be useful in hæmorrhagic diathesis, also in purpura.
Also in intestinal hæmorrhage, 417.

HÆMORRHAGE, POST-PARTUM.

Compression of aorta, 449. Might possibly be of service.
Ice, 88. Pushed into uterus or rectum.
Ipecacuanha, 449. Large doses recommended.
Iron, 230. Perchloride, diluted, as injection.
Mechanical excitation of vomiting, 449.
Opium, 568. ʒj. with brandy when much exhaustion of uterus.

HÆMORRHOIDS. (*See* PILES.)

HAIR, TO PROMOTE GROWTH OF. (*See* BALDNESS.)

HAY FEVER. (*See* CORYZA.)

HEADACHE. (*See also* SICK HEADACHE.)

Actæa racemosa, 466. In nervous or hysterical women, especially when it occurs at the menstrual period; also when from overstudy or fatigue.
Ammonia, 194. As a lotion. (*See* Change of Life.)
Arsenic, 310. For throbbing pain in one brow.
Belladonna, 537. When pain over brows and in eyeballs—often due to stomach or uterine derangements—met with specially in young women. Three minims of the tincture every three hours.
Bitartrate of potash, 214, 215. Sulphate of soda, and tartrate of potash and soda control headache.
Bromide of potassium, 153, 154. A large dose in nervous or sick headaches.
Camphor, 412. A saturated solution in eau de Cologne rubbed on the head in headache of uterine origin.
Carlsbad waters, 215.
Chloride of ammonium, 211. When due to menorrhagia or amenorrhœa.
Citrate of caffeine, 595. For sick headache.
Cold affusion, 73. Water poured gently over forehead, sometimes very hot affusion better.
Ether spray, 90. For frontal headaches after acute illness or fatigue.
Friedrichshall water, 214. A wineglassful in a breakfast-cupful of hot water in bilious sick headache.
Hot sponging, 68. To face, temples, and neck in influenza, catarrh, etc.
Hot water, 68. To feet and legs.
Ice-bag, 74, 88. To head, as in headache of acute fevers.
Mercury, 276. As blue pill for sick headache.
Mustard, 431. In a hot foot-bath, or as poultice or "mustard leaf" to nape of neck in various forms of headache.
Podophyllum, 461. In nervous headaches near the menstrual periods with constipation and dark stools. Purgative doses often give relief. (*See also* p. 3.)
Salicylate of soda, 618. Useful in 15-20 gr. doses.
Sitz-bath, 55. At 60° to 80°.
Tea, 592. And coffee in headaches from nervousness or exhaustion.
Veratrum viride, 453. Tincture in the congestive headache at the menstrual period.
Zinc, oxide of, 282. In two to five grain doses for nervous headache. Bismuth also useful.

HEART, DISEASES OF. (*See also* ANGINA PECTORIS, *also* ENDOCARDITIS.)

Aconite, 472. When violent throbbing and extreme pain in pericarditis.
Adonidin, 495. Similar to digitalis—useful in mitral disease.
Alcohol, 360, 361. Brandy or wine when heart suddenly enfeebled by fright, loss of blood, accident, etc.
Antistreptococcic serum, 655. In malignant endocarditis, which see.

HEART, DISEASES OF—*continued.*

Arsenic, 298. For breathlessness on exertion from weakly-acting heart.
Blisters, 107. Flying, over præcordial region to stimulate the action of the heart in extreme weakness; also in pericarditis, 108.
Caffeine, 591. Also as sodio-salicylate, 595.
Camphor, 413. In heart failure.
Cocaine, 602. In palpitation of dilated atonic heart.
Cod-liver oil, 325. In chronic inflammation.
—— 326. With quinine, for giddiness due to weak heart in the aged.
Convallaria, 491. Somewhat similar in action to digitalis.
Digitalis, 478, 479. Of eminent service where dropsy, dyspnœa, livid face, frequent irregular pulse and dilatation of left ventricle, especially when due to mitral disease. The freshly-made infusion best, 481. These cases require alcohol—gin best.
—— 481. Where much dilatation and hypertrophy of left ventricle without valvular disease. It is not contra-indicated when aortic disease.
Where, though the heart beats tumultuously and strongly, the pulse is weak and dyspnœa great.
—— 481. Irregularity of pulse best indication for digitalis.
—— 483. Da Costa strongly recommends digitalis for "irritable heart." (*See* ref.)
—— 484. Very useful in pure hypertrophy due to valvular disease or excessive muscular exertion. Also in aortic regurgitant disease when compensatory hypertrophy excessive. 485. Two to five minims of the tincture enough—aconite often better.
——487. Combined with mercury and opium.
Elaterium, 628. In dropsy. Caution needful.
Ether, 377. Hypodermically in heart failure. (*See* ref.) Also with digitalis.
Iodide of potassium, 144. In pericarditis, certain cases of.
Morphia, 564. Hypodermically for dyspnœa of disease of heart and large vessels and of intrathoracic tumours. More useful in mitral than in aortic disease.
Musk, 429.
Nauheim-Schott treatment, 80.
Nitrite of amyl, 402. In cardiac dyspnœa due to hypertrophied and dilated heart; also in syncope.
Opium, 562. In heart weakness of fevers.
Poultices, 83. Large, hot, and frequently renewed, in pericarditis.
Purging, 633. With jalap, etc., in engorgement of right side of heart from emphysema and bronchitis, mitral obstructive or regurgitant disease. Where severe headache and pain at epigastrium, bleeding gives instant ease.
——634. In persistent tricuspid regurgitation from permanent distension of the right heart; purgatives only useful when an attack of bronchitis causes an exacerbation.
Sparteine, 493. Prompt action of, 494.
Squill, 641.
Strychnia, 577. In medicinal doses it is said to strengthen the heart beats. (*See also* 578.)
Strophanthus, 492.
Veratria, 455. As ointment to chest when rapid irregular pulse, hurried breathing, much lividity and dropsy, palpitation and inability to lie down.

HEARTBURN. (*See* STOMACH, DISEASES OF.)

HECTIC. (*See* WASTING DISEASES.)

HEMICRANIA. (*See* SICK HEADACHE.)

HEPATIC ABSCESS. (*See* LIVER, DISEASES OF.)

HERNIA.

Chloroform, 374. Inhalation to assist reduction.
Tobacco clyster, 495. Superseded by Chloroform.

HERPES.

Acetic acid, 160. Applied to a patch of herpes circinnatus to cut it short.
Blisters, 109. For obstinate neuralgia following shingles.
Collodion, 317. Painted over patches before vesicles developed, but inferior to nitrate of silver.
Hot fomentations, 82. Will often disperse or restrict development of herpes labialis.
Iodine, 133. Liniment once applied enough for herpes circinnatus.
Morphia, oleate of, 261. Locally without friction in herpes zoster.
Silver, nitrate of, 251. To be painted on the warning patch of erythema, before or as soon as the vesicles begin to form; in herpes labialis, also in shingles.
Veratria, 455. The ointment, one scruple to two scruples to the ounce in neuralgia following shingles.

HICCUP.

Apomorphia, 451.
Camphor, 414.
Chloroform, 366, 375. Often combined with opium.
Morphia, 565. Hypodermically often arrests persistent hiccup.
Mustard, 431. A drachm infused in four ounces of boiling water has cured most obstinate cases.
Nitro-glycerine, 409. Sometimes cures.

HOARSENESS.

Alum, 227. Ten grains to one ounce of water in chronic coughs and hoarseness as spray.
Borax, 180. A piece the size of a pea allowed to dissolve in the mouth.
Glycerine of tannin, 338. Locally in chronic inflammation of the throat.
Iodine inhalations, 135. Hoarseness with hollow cough and some wheezing.
Ipecacuanha wine, 448. As spray when congestion of vocal cords.
Sulphurous acid, 171. Inhalation spray, or fumigation, in clergymen's hoarseness.
Turkish bath, 76. At commencement of a feverish cold will often cut it short, together with the accompanying hoarseness. Will also remove residual hoarseness after severe cold.

Hodgkin's Disease. (*See* Lymphadenosis.)

Hordeolum.

Mercury and morphia, oleate of, 260. The 20 per cent. ointment with lard outside the eyelid.

Hydrocephalus.

Croton oil, 391. Said to remove fluid from ventricles.

Hydrocele.

Iodine, 134. Tincture to inject into cavity after paracentesis.

Hydrophobia.

Curare, 503.
Inoculations, 652.

Hydrothorax. (*See also* Pleurisy.)

Pilocarpine, 513. Probably useful in removing effusion.

Hyperæsthesia.

Bromide of potassium, 155, 156, 157.

Hyperpyrexia.

General cold bath or ice-cold cloths, 61. (*See also* pp. 50, 62–64.)

Hypochondriasis.

Bromide of potassium, 153. Where great despondency amongst males but especially amongst female subjects who live in towns.

Hypostatic Congestion.

Flying blisters, 107.

Hysteria.

Aconite, 475. For "fluttering of the heart" in nervous persons.
Actæa, 465. For headache.
Alcohol, 359. With plenty of volatile ether;—care must be taken that it does not lead to tippling.
Apomorphia, 451.
Assafœtida, 428.
Bromide of potassium, 156. Gives control and prevents paroxysms. When verging on nymphomania large doses required.
Cannabis indica, 584. In some cases.
Chloroform, 366. Often combined with opium.
Cod-liver oil, 326. In middle-aged people with dyspepsia or "craving" at epigastrium.
Iron, 236. A course often useful, especially when anæmia or uterine obstructions.
Morphia, 567. Hypodermically when flitting neuralgia with great depression.
Musk, 429. Has been given.
Nux vomica, 577. The tincture, especially when combined with small quantities of laudanum, of great use in the so-called hysteria of middle-aged people, with flatulence, weight on head, flushings and hot and cold perspirations.
Opium, 566. A drop of laudanum with two of the tr. of nux vomica three or four times a day for weight on head with flushings, perspirations, depression, etc.
Paraldehyde, 387. As hypnotic dose, 33 to 50 min.
Phosphorus, 316. In hysterical paralysis.
Valerianate of zinc, 426. Especially at the change of life.
Volatile oils, 423.
Zinc, 282. Especially the valerianate in some forms of hysteria.

Ichthyosis.

Thyroid extract, 661.
Warm bath, 67.

Impetigo.

Glycerine of tannin, 336.
Oils, 320. To facilitate removal of scabs.
Poultices, 337. At night, to remove the scabs.
Quinine, 611.
Sulphate of copper, 277.
Sulphur, 121. Internally.
Zinc, 280. The ointment of the oxide after inflammation subsided, when raw surface indolent; oxide and carbonate used as dusting powders, but greasy applications generally better.

Impotence.

Cannabis indica, 585.
Cantharides, 436. In large doses (twenty or thirty drops of the tinct. or half a grain of the powder) with iron and phosphoric acid or nux vomica.
Phosphorus, 316.
Strychnia, 578. Sometimes useful in large doses when spermatorrhœa.

Incontinence of Urine.

Belladonna, 538. The best remedy for children—ten to twenty drops of the tinct. three times a day. If unsuccessful, and no worms or other irritation exist, try strychnia, cantharides, turpentine, santonine, or galvanism.
N.B. The child should drink but little some hours before going to bed, and should be waked in the middle of the night to pass water.
Cantharides, 436. One or two drops of the tinct. three or four times a day in middle-aged women or the aged, even when due to paralysis; sometimes also in children, but for them belladonna is generally better.
Chloral, 383. In children.
Collodion, 319. Painted to form a cap over end of prepuce.
Ergot, 589. Said to be useful.
Iron, 236. Sometimes useful even when no worms.
Nitrate of potash, 221. Has been recommended for children.
Strychnia, 578. Sometimes useful for old people with paralysis of the bladder; also for the incontinence of children.

Indigestion. (*See* Dyspepsia.)

Infantile Paralysis. (*See also* Paralysis.)

Strychnia, 576.

INFLAMMATION.

Aconite, 469, 470. Gives most brilliant results when inflammation not very extensive or severe, as in catarrh of children, tonsillitis and acute sore throat. In the graver inflammations, as pneumonia, pleurisy, etc., the effects are equally manifest though less rapid, 472. In pericarditis, with violent throbbing and extreme pain, aconite will quiet the undue action and relieve the pain, 472. It has a beneficial influence in acute specific fevers, 473. It is of marked service in erysipelas and the inflammation sometimes following vaccination. It is also of use in acute rheumatism, otitis, and gonorrhœa.
Alcohol, 354. As an evaporating lotion.
Antimony, 288. Should be given at the beginning, a quarter to half a grain every two or three hours, or a lesser proportionate dose every hour; useful in tonsillitis, pleurisy, orchitis, bronchitis, puerperal peritonitis, inflammation of breast, whitlow, etc.
Atropia, 530. In inflammations of eye.
Belladonna, 530.
Cod-liver oil, 325. In many chronic inflammations, as of the heart, lungs, and kidneys.
Digitalis, 487. Large doses asserted to be capable of subduing acute inflammations, if used at the commencement. (Aconite much safer and better.)
Fomentations of a small teaspoonful of the leaves in half a pint of boiling water said to be valuable for acute inflammation of joints and of the breast, and for erysipelas, 488.
Eucalyptol, 425. In chronic inflammation of bladder.
Fomentations, 82, 87.
Ice, 88. In very small pieces in a bladder applied to inflamed part.
Iodides, 139. Locally and internally in inflammatory thickenings.
Iodine, 133, 134. The liniment in the neighbourhood of local inflammation so as to produce vesication, also directly over *chronically* inflamed parts. *See* caution, 133.
Menthol, solution of, 416. Painted several times a day over inflamed tissue of boils and carbuncles.
Also for excessive inflammation after vaccination.
Mercury, 275. Bichloride in iritis, and inflammations of deep-seated parts of eye and in other inflammations, especially those of serous membranes. Oleate probably useful, 261.
Mustard, 431.
Nitrates, 221. Opinions concerning the efficacy of these in acute inflammation discrepant.
Opium, 554. Poultices containing laudanum allay pain in superficial and deep-seated inflammation. Morphia injections sometimes needed in pleurisy, pneumonia, etc. An extract of opium has been recommended as a local application for carbuncles and boils. Opium wine of the 1864 Pharmacopœa, which contains no spices, is very useful in the pain of conjunctivitis dropped into the eye. Opium mixed with tannin or creasote may be introduced into the hollow of a painful tooth if the pain is produced by inflammation of exposed pulp.
Packing, 56. In acute inflammatory diseases.
Poultices, 82. To check formation of pus or assist in maturation.

INFLAMMATION—*continued.*

Soap liniments, 182. In chronic inflammation.
Sulphides, 124, 125. In boils, abscesses, and deep-seated suppuration.
Warm or tepid baths, 67.

INFLUENZA.

Cubebs, 424. ʒss. to ʒj. of tinct. in linseed tea for subsequent cough.
Hot sponging, 68. For headache.
Sulphurous acid, 171. Fumigation or inhalation. (*See* ref.)

INGROWING TOENAIL.

Liquor potassæ, 179. Diluted, constantly applied on cotton-wool.

INSOMNIA. (*See* SLEEPLESSNESS.)

INTERMITTENT FEVER. (*See* AGUE.)

INTERTRIGO.

Bismuth, 240. Nitrate or carbonate, as dusting powder.
Camphor, 411. As addition to dusting powders, to allay heat and itching.
Carbonate of lime, 201. Or Oxide of zinc or bismuth sometimes useful as dusting powder. More often greasy applications better.
Glycerine of tannin, 338. Sometimes useful.
Lime-water, 201, 204.
Soap, 178. Free ablution with, when caused by acid secretions, smear afterwards with greasy application.
Zinc oxide, 280.

INTESTINAL CATARRH.

Eucalyptol, 426.
Hydrastis, 590.

INTRATHORACIC TUMOUR, DYSPNŒA OF.

Morphia, 564.

INTUSSUSCEPTION.

Forced enemata, 98.

IODISM.

Arsenic, 142. Combined with iodide mixtures will modify or prevent skin eruptions.

IRITIS. (*See* EYE, DISEASES OF.)

IRRITABILITY.

Chloral, 383. Five grains two or three times a day in irritability with nervousness and restlessness.
Podophyllum, 460. Irritability with constipation.
Sitz-bath, 55, 75. At 60° to 80°.

ITCH.
- **Alkalies**, 176. As soap or ointment to remove cuticle and break up burrows.
- **Baking of clothes**, 170. Must not be forgotten.
- **Iodide of potassium**, 139. As ointment.
- **Storax**, 118, 421.
- **Sulphur**, 116, 117. Ung. sulph. after bath; various formulæ for.
- **Sulphur and lime**, 122. This use of sulphur is as sulphide (see also use of Vlemingkx solution, p. 123.)
- **Sulphurous acid**, 170. As gaseous bath. This is the quickest method.
- **Warm baths**, 67.

ITCHING. (*See* PRURITUS.)

JAUNDICE. (*See* LIVER, DISEASES OF.)
- **Ammonium chloride**, 211. Catarrhal jaundice.
- **Iodoform**, 398. In catarrhal form.
- **Mercury**, 269. In attacks of jaundice, lasting three or four days accompanied by depression and preceded by sickness and coated tongue, one-sixth or one-third of a grain of grey powder taken at the onset and repeated three or four times a day, very valuable. If obstinate constipation, a course of Carlsbad waters sometimes more efficacious.
- **Phosphate of soda**, 217. In catarrhal form.

JOINTS, DISEASES OF.
- **Aconite**, 474. For pains in inflamed joints.
- **Arsenic**, 311. Often serviceable in rheumatoid arthritis, and nodosity of joints. Large doses long continued necessary. Action capricious, sometimes useless, at others remarkably good.
- **Cod-liver oil**, 325. When strumous.
- **Cold douche**, 74. For stiffness from traumatism, gout or rheumatism, salt may be added to water.
- **Digitalis**, 488. As fomentations (*see* Inflammation.)
- **Galvanism**, 79. For stiffness.
- **Hot sand douches**, 88.
- **Iodine**, 134. Solution injected into white swellings.
- **Mercury**, 269. Locally applied, as Scott's ointment, in chronic inflammation of knee—better still as oleate of mercury, 200.
- **Salicylate of soda**, 617. Locally, relieves inflamed joints.
- **Turkish bath**, 79. For stiffness.

KIDNEYS, HÆMORRHAGE FROM. (*See* HÆMATURIA.)

LABOUR. (*See* CONFINEMENT.)

LACTATION, EXCESSIVE.
- **Alcohol**, 364. As stout, often useful—not always.
- **Belladonna**, 525. Internally or externally, or both.
- **Phosphate of lime**, 207. In debility of prolonged suckling.
- **Potassium, iodide of**, 145. To lessen secretion.
- **Quinine**, 611. Has been recommended.
- **Tannin and gallic acid**, 340. To lessen secretion of milk.
- **Tobacco**, 495. With lard externally said to arrest secretion of milk.

LARYNGISMUS STRIDULUS.
- **Bromide of potassium**, 149, 152. When uncomplicated, except with convulsions.
- **Cod-liver oil**, 326.
- **Cold sponging**, 69, 70. Twice or thrice daily—sometimes immediately successful—prevents convulsions. Take care no laryngitis.
- **Cold water dashed in face**, 70. Often arrests paroxysm.
- **Lancing gums**, 70, 71. If swollen, red and hot, may require repetition.
- **Lobelia**, 582. Has been employed.
- **Worms, removal of**, 70, 71. Treat faulty state of mucous membrane, and any irregularities of bowels, etc.

LARYNX, DISEASES OF.
- **Aconite**, 470. In spasmodic laryngitis or catarrhal croup very valuable.
- **Apomorphine**, 451. In laryngitis.
- **Benzoin, compound tincture of**, 422. In laryngitis.
- **Bromide of potassium**, applied locally, 148, in irritability of larynx; also use internally.
- **Caffeine**, 594. As anæsthetic.
- **Cocaine**, 600. A 20 per cent. solution locally, as anæsthetic for examinations and operations. Also in irritable inflammatory states.
- **Iodoform**, 398. In tuberculous laryngitis.
- **Iodol**, 399.
- **Menthol**, 415. As pigment.
- **Silver, nitrate of**, 253. Powdered or in solution to chronically inflamed larynx, as in phthisis.
- **Sulphurous acid**, 171. Inhalation, spray, or fumigation.

LEAD COLIC. (*See* POISONING BY LEAD.)

LEAD POISONING. (*See* POISONING.)

LEECH BITES.
- **Silver, nitrate**, 250.

LEPRA. (*See* PSORIASIS.)

LEUCOCYTHÆMIA. (*See* LEUKÆMIA.)

LEUCORRHŒA.
- **Alkalies**, 159, 178. A weak injection when excessive secretion from glands of os.
- **Alum**, 226. A drachm to a pint of water as injection. (*See* mode of applying, p. 179.)
- **Belladonna**, 529. With tannin as bolus where neuralgia or ulceration of os.
  When disease due to over-secretion of mucous glands about the os, and much pain present, inject sodæ bicarb., one drachm, tinct. bellad., two ounces, aq., one pint. (*See* ref.)
- **Bicarbonate of potash or soda**, 178, 179. One drachm to a pint of water as an injection, especially when discharge alkaline and copious. (*See* ref.)
- **Boracic acid**, 173. As lotion.
- **Borax**, 179.
- **Carbolic acid**, 351. Diluted as injection for vaginal leucorrhœa.
- **Cold sponging**, 72.
- **Copper**, 278. Solutions of the sulphate as injections.

LEUCORRHŒA—*continued.*

Ergot, 589. Said to be useful in some cases.
Hydrastis, 590.
Iron, 237. Internally.
Lead, 244. As injections.
Lime-water, 202. As injection.
Phosphate of lime, 207.
Tannin, 837. As injection. If os ulcerated a suppository of tannin and cocoa-nut fat to mouth of uterus.
Zinc, sulphate of, 280. Sometimes added to alum injections.

LEUKÆMIA.

Arsenic, 298.
Red bone-marrow, 663. In pseudo-leukæmia of infants.

LICE.

Essential oils, 258, 421. The body-louse may be killed by essential oils, as rosemary, or by powdered pyrethrum, or by ointment of staphisagria.
The under linen should always be boiled.
Mercury, 258. Nitrate of mercury ointment or corrosive sublimate wash for lice on all parts of the body.
—— 260. The oleate destroys lice immediately, and simultaneously kills the ova.

LICHEN.

Alkalies, 176. (*See* Pruritus.)
Arsenic, 306. Sometimes useful.
Cantharides, 435. Internally.
Chloroform, 365. As ointment to allay itching.
Cyanide of potassium, 551. Or hydrocyanic acid. (*See* Pruritus.)
Mercury, 257. Calomel and nitrate of merc. oint. may be mixed, and tar oint. is sometimes added, in patches of obstinate lichen, especially of the hands, even when not syphilitic.
Silver, nitrate of, 251. The nitrous ether solution to be painted every day or second day on a patch of lichen the size of the palm with excessive irritation.
Sulphides, 122. As baths.
Warm bath, 67.

LIVER, DISEASES OF.

Ammonium chloride, 211. In congestive stage of cirrhosis, and in hepatic congestion threatening abscess.
Euonymus, 637. As hepatic stimulant—probably inferior to mercury and podophyllum.
Iodoform, 398. In cirrhosis.
Nitric acid, 165. In long-standing diseases, as congestion and cirrhosis, it will augment flow of bile after liver has struck work from excessive use of mercury.
Phosphate of soda, 217. In 10 gr. dose in milk for children passing pasty white stools.
Sulphates, 214, 215, 216. In purgative natural waters—small doses oft repeated; sulphate of potash occasionally poisonous. (*See* Carlsbad Treatment, p. 215.)

LOBULAR PNEUMONIA. (*See* BRONCHITIS.)

LOCHIA, SUPPRESSION OF.

Actæa, 465.

LOCOMOTOR ATAXY.

Antipyrine, 622. For pains.
Calabar bean, 506. Has proved very beneficial.

LOINS, PAINS IN.

Lead, 244. As plaster, when pain due to weakness, better than a pitch plaster.
Also useful when pain due to uterine disease or piles.

LUMBAGO.

Actæa racemosa, 465. Said to subdue lumbago more effectually than any other remedy.
Acupuncture, 90, 102. Succeeds best when loin muscles of both sides affected, pain being most severe on to-and-fro movement. Needle to be run an inch or more over seat of greatest pain on each side. Sometimes on withdrawal cure is complete. When sciatica associated with it, lumbago hard to cure. Acupuncture useless when high fever, or when acute rheumatism is commencing (p. 103).
Belladonna, 103, 524. As plaster very valuable for persistent remains affecting a small spot.
Capsicum, 432. A strong infusion applied on lint.
Ether spray, 90, 102. Locally applied as freezing mixture. Also freezing with ice and salt (p. 102.)
Faradization, 102. Almost as successful as acupuncture.
Galvanism, 83, 84, 90. Highly useful.
Guiacum, 463.
Hot flat iron, 102. The back to be ironed, a piece of brown paper intervening.
Ice and salt, 90. Locally applied as freezing mixture.
Iodide of potassium, 144.
Morphia, 563. Hypodermically injected, often successful at once.
Nitrate of potash, 221. Ten grains hourly or every two hours, when urine scanty and high-coloured, becoming turbid on cooling.
Plaster of lead or pitch, 103. Applied after cure effected.
Poultices, 83, 84. Very hot. Should be continued for three hours, then the skin covered with flannel and oiled silk.
Quinine, 611.
Salicylate of soda, 618.
Salol, 619. 10 to 15 grs. hourly.
Thermic hammer, 103.
Turkish bath, 79.
Turpentine, 417, 419. In twenty-drop doses.
Veratrum viride, 453. As tincture, said to be useful.

LUNGS, HYPOSTATIC CONGESTION OF.

Blisters, 107. Flying blisters to chest and perhaps along pneumogastric nerves.

LUNGS, INFLAMMATION OF. (*See* PNEUMONIA.)

LUPUS.

Arsenic, 290. Arsenious acid as a caustic.
Blisters, 110. In erythematous lupus.
Carbolic acid, 349.
Iodine, 132. As tincture or liniment to edges and around.
Iodoform, 397.

LUPUS—*continued.*

Lead, 243. Liq. plumbi with one or two parts glycerine, applied warm after crusts removed in milder forms.
Mercury, 258. Ointments in erythematous lupus—calomel oint. in scrofulous and tubercular lupus of children.
Acid nitrate for touching summit of tubercle; if application painful, cover spots with collodion.
Silver, nitrate of, 251. A weak solution gradually strengthened in superficial kinds of lupus.
Thyroid extract, 661.
Zinc, 279. Chloride, iodide, and nitrate locally.

LYMPHADENOSIS.

Arsenic, 298.

LYMPHATICS, INFLAMMATION OF.

Belladonna fomentations, 83.

MALARIA. (*See* AGUE.)

Iodine, 136.
Quinine, 608, 609. And allied alkaloids (*see* Ague); also for neuralgia dependent on malarial poison.
Turkish bath, 77. The cautious use of, for those suffering from various diseases caused by long residence in a tropical climate.

MALIGNANT PUSTULE. (*See* ANTHRAX.)

MALNUTRITION. (*See* DEBILITY.)

MAMMARY GLAND. (*See* GLANDS.)

MAMMARY ABSCESS. (*See also* BREASTS, INFLAMMATION OF.)

Ammonium, carbonate of, 194. As fomentation.
Belladonna, 126, 525.
Mercury and morphia, oleate of, 260. Locally.
Sulphide of calcium, 125. Internally—occasionally the pain is temporarily increased.
Tobacco, 495. The leaves as a poultice.

MANIA, ACUTE.

Actæa, 466. After confinement or during pregnancy.
Antimony, tartar emetic, 238. In puerperal and other forms.
Bromide of potassium, 156. In puerperal mania and nymphomania; also in other forms of mania.
Cannabis indica, 584. A drachm of the tinct. with a drachm of bromide of potassium.
Chloral, 381. In acute and puerperal mania.
Cold douche, 73. In maniacal delirium—place patient in a warm bath during the application.
Conium, 502.
Croton oil, 331. As a purgative—a quarter or third of a minim every hour.
Duboisine, 551.
Gelsemium, 522. When sleeplessness,
Hyoscyamine and hyoscine, 547. 549. In violent intermittent forms.
Hyoscyamus, 547. To produce sleep and calm violent delirium.

MANIA, ACUTE—*continued.*

Morphia, 564, 566. Hypodermically to induce sleep, etc.
Opium, 561. Many cases may be satisfactorily treated with opium and tartar-emetic.
Paraldehyde, 387. Dose 45-120 min. as hypnotic.
Pack, the wet, 58. In certain cases of insanity with maniacal excitement: safety of, when properly applied.

MEASLES.

Aconite, 473. To moderate the catarrh and bronchitis.
Antifebrine, 623, 624. Also Antipyrine.
Carbonate of ammonium, 197. In three or five grain doses, every two or three hours.
Cod-liver oil, 325. In sequelæ of measles.
Cold bath, affusion, etc., 59. At commencement.
Fat, 320. Hands and feet to be rubbed with a firm fat to remove heat and tightness produced by rash.
Iodine, 135. Tinct., inhalation for hoarseness and wheezing.
Mustard, 431. As bath on sudden retrocession of rash.
Packing, 57. Especially on retrocession of rash.
Purgatives, 218. Must be given with caution.
Veratrum viride, 452. Has been employed.

MEGRIM AND MIGRAINE. (*See* SICK HEADACHE.)

MELANCHOLIA.

Bromide of potassium, 153. For townspeople, especially women, with unendurable despondency.
Camphor, 414.
Morphia, 565. Hypodermically useful in patients with a peculiar idiosyncrasy. (*See also* 567.)
Musk, 420. Also castoreum.
Phosphorus, 316.

MENIÈRE'S DISEASE. (*See* VERTIGO, AURAL.)

MENINGITIS.

Antimony, 283. Tartar-emetic ointment as counter-irritant to scalp in tubercular meningitis.
Bromide of potassium, 152. In the convulsions after simple meningitis.
Croton oil, 331. Internally in hydrocephalus supposed to remove excess of fluid.
Ice, 83. In a bag as a cap.

MENOPAUSE. (*See* CHANGE OF LIFE.)

MENORRHAGIA.

Actæa, 465. For headache accompanying profuse menstruation.
Bromide of potassium, 156. Most useful in young women; if loss only at natural period, commence bromide a week before, and discontinue when it has ceased till a week before next time.
If loss occur every two or three weeks,

MENORRHAGIA—*continued*.
give bromide continuously—10 gr. dose, but more when organic changes in womb.
Cannabis indica, 585. Very useful.
Chloride of ammonium, 211. For headaches.
Digitalis, 488. Permanently efficacious when no organic disease, often temporarily so when there is.
Ergot, 588. Of great use in all forms, even when the hæmorrhage proceeds from tumours.
Hamamelis, 342. Or hazeline.
Hydrastis, 590.
Ipecacuanha, 449. In flooding.
Iron perchloride, 230. Inject into uterus in flooding after delivery.
Lemons, 168. Sucking—a domestic remedy.
Oil of cinnamon, 424. Drachm doses.
Opium, 568. In flooding after confinement.
Phosphate of lime, 207. In anæmia from excessive menstruation.
Quinine, 611. Has been recommended.
Spinal hot-water bag, 92. To lower dorsal and lumbar vertebræ.
Sulphuric acid, 168.
Tannin and gallic acid, 340.

MENSTRUATION, DISORDERS OF. (*See* AMENORRHŒA *and* MENORRHAGIA.)

MESENTERIC DISEASE. (*See* GLANDS.)

MICTURITION, FREQUENT. (*See* INCONTINENCE OF URINE.)
Cantharides, 436. In women who micturate too frequently or involuntarily on coughing from weakness of sphincter. One- or two-drop doses.

MICTURITION, PAINFUL.
Alkalies, 185. When caused by uric acid in spicular crystals in young male children.
The citrates are best suited for this.
Camphor, 414.
Cannabis indica, 584. Said to relieve dysuria and strangury; bloody urine said to be a special indication for this.
Cantharides, 436. A drop of the tincture (sometimes five required) three times a day for frequent desire to micturate with pain.

MIGRAINE. (*See* SICK HEADACHE.)

MILK, EXCESSIVE SECRETION OF. (*See* LACTATION, EXCESSIVE.)

MILK, TO PROMOTE SECRETION OF.
Jaborandi, 511.
Phosphate of lime, 207.

MISCARRIAGE, TO PREVENT.
Actæa, 465.

MOSQUITOES.
Carbolic acid, 353. A weak solution sponged over the body to keep off mosquitoes.

MOUTH, DISEASES OF. (*See also* STOMATITIS.)
Arsenic, 292. In a peculiar circular rash on the tongue, usually in children associated with stomach or intestinal disturbance, or a body rash; also in sloughing of the mouth or throat, cancrum oris, etc., p. 305.
Borax, 180.
Chlorate of potash, 222. In ulceration of gums and the parts of the tongue and cheek in contact with this.
In follicular and phagedenic ulceration.
Chlorine solution, 130. In ulceration.
Cocaine, 601. A solution painted over fissures, ulcers, and painful swellings on tongue, lips, or mucous membrane of cheeks. Must be repeated.
Creasote, 345. Or carbolic acid gargle or wash in sloughing.
Lime-water, 202. In inflammatory and ulcerative diseases.
Nitric acid, 162. When reddened, inflamed and glazed mucous membrane.
Salicylic acid, 613. One part (dissolved in alcohol) to 250 of water in catarrhal stomatitis and thrush.
Silver, nitrate of, 252. Applied to ulcers of mouth.
Sulphate of copper, 278. Applied solid to indolent sores of tongue.
Solution painted over edges of gums in ulcerative stomatitis, but generally dried alum is better.

MUCOUS TUBERCULES. (*See* SYPHILIS.)

MULTIPLE NEURITIS.
Strychnine, 576.

MUMPS.
Mercury, 276. The third of a grain of grey powder three or four times a day very useful relieving pain and swelling.
Pilocarpine, 513.

MUSCLES, STIFFNESS AND ACHING OF, FROM EXERTION.
Arnica, 57.
Dripping wet sheet, 67. Well rub afterwards.
Turkish bath, 76.

MYALGIA.
Actæa, 465.
Belladonna, 84, 524. Often successful as liniment, though sometimes an opium liniment better.
Camphor, 411.
Chloride of ammonium, 211.
Ether, 84. As spray.
Iodine, 133. The ointment for pain in the muscles of the chest, these being tender on pressure, though the skin may be pinched without pain.
Menthol, 415.
Opium, 554. Poultices or frictions with laudanum.
Poultices, 83, 84. Very hot, followed by application of lint and oilskin.
Turpentine, 417.

MYXŒDEMA.
Thyroid, treatment of, 659, 660.

NÆVUS.

Zinc, 279. Chloride, iodide, and nitrate locally.

NEPHRITIS. (*See* BRIGHT'S DISEASE.)

NERVOUS HEADACHE. (*See* SICK HEADACHE.)

NERVOUSNESS.

Bromide of potassium, 153. Especially for women who are despondent, irritable and sleepless from overwork, grief, worry, etc., often connected with migraine.
Chloral, 383. When restlessness and irritability.
Chloroform, 366. As spirits of chloroform internally.
Cold sponging, 72. When from close rooms, etc.
Morphia, 565, 566. (*See* ref.)
Sparteine, 494. In general nervous excitement.

NETTLE RASH. (*See* URTICARIA.)

NEURALGIA.

Aconite, 466. As ointment or liniment, especially when fifth nerve affected, also in neuralgic sick headache—sometimes veratria better, 467. Spinal irritation and intercostal neuralgia generally yield better to belladonna preparations. Sometimes internally, 474.
Acupuncture, 104. At "corresponding spot" on the opposite side.
Alcohol, 359. With much volatile ether—care must be taken in prescribing it.
Antifebrine, 623.
Antipyrine, 622.
Arsenic, 309. In various neuralgias, also in angina pectoris.
Atropia, 537. Trousseau's method—give one fifth gr. extr. bell. every hour till giddiness induced, then lessen dose, but continue the medicine for several days.
Belladonna, 524 and 537. The liniment or the ointment of atropia sometimes useful.
Camphor, 411.
Cannabis indica, 534. Has been found useful.
Capsicum, 432. A strong infusion on lint covered with gutta percha.
Carbonic acid gas, 115. Injected into vagina for neuralgia of uterus.
Chamomile, 627. In neuralgia of the fifth nerve.
Chloral, 383. Sometimes relieves.
Rubbed with an equal weight of camphor or menthol and painted on painful part or gently rubbed in, often useful in neuralgia, pleurodynia, and toothache.
Chlorate of potash, 223. Has been recommended in facial neuralgia.
Chloride of ammonium, 211. In half-drachm doses in facial neuralgia, much used also for all neuralgias.
Chloroform, 365. Occasionally useful locally. As spray for neuralgia of uterus. Two or three drops on cotton-wool in ear for face-ache and toothache.
—— 374. Inhalation.
—— 375. Subcutaneously. (*See* ref.)
Cocaine, 602. ⅓ to ½ gr. in solution hypodermically in course of nerve.
Conium, 501, 502. Internally; also in tic.
Counter-irritation, 109. A blister to temple or behind the ear of the greatest service in frontal and facial neuralgia—that depending on a diseased tooth often yields to a blister, also the migratory neuralgic pains in nervous women and the intercostal neuralgia left by shingles. Blisters should be applied, according to Anstie, to a posterior branch of the spinal nerve-trunk from which the painful nerve issues.
If blistering paper does not succeed in neuralgia a stronger preparation to be tried.
Croton-chloral, 391. Five-grain doses, especially in facial neuralgia; in that due to carious teeth; in that of the neck and back of head; in dysmenorrhœal neuralgia, and in epileptiform tic. Croton-chloral may be combined with gelsemium.
Also in pain in occipital and auricular nerves, 395.
Ergot, 589. Said to be useful.
Ether, 376. As spray sometimes relieves permanently, often only temporarily.
Exalgine, 624.
Gelsemium, 513. In non-inflammatory toothache and neuralgia of nerves supplying teeth and alveolar processes.
—— 522. When dental nerves affected even where carious teeth. Sometimes toxic doses required. Said to be useful in ovarian neuralgia.
Hydrocyanic acid, 551. And cyanide of potassium, formerly employed locally.
Hyoscyamus, 547.
Ice, 89. Locally in neuralgia of testes.
Iodoform, 397. As saturated solution in chloroform, locally.
Iron, 236. When associated with anæmia, but no organic cause. Moderate doses only required.
Menthol, 415.
Methyl chloride, 377. As spray esp. in sciatica. (*See* ref.)
Morphia, oleate of, 261. One or two grains to a drachm, locally.
Nitrite of amyl, 403. Inhalation when fifth nerve affected.
Oil of peppermint, 421. To be painted over the part in facial neuralgia.
Opium, 554, 563. Or a hypodermic injection of morphia—sometimes a single injection will cure old-standing cases, if not it may be repeated every second day or so for some time. (*See also* Whitla's method, 563.)
Phenacetine, 623.
Phosphorus, 315. From 1-100th to 1-12th grain every three hours. Very useful in all forms of neuralgia, especially when uncomplicated.
Quinine, 609, 610. In periodical neuralgia, whether malarial or not, large doses should be given just before the expected attack.
Useful also in small frequently-repeated doses in other neuralgias, especially of the supra-orbital nerve.
Salicylate of soda, 618. Inferior to other remedies.
Salol, 619.
Stramonium, 550. Has been used.
Turpentine, 417.
Valerianate of zinc, 427. Or valerianate of ammonia in neuralgia of face or head.
Veratria, 454. An ointment of the pharmacopœial strength enough for the face, but stronger ones necessary for sciatica and other neuralgias, also for the pain consequent on shingles.
—— 453. Tinct. of veratrum viride said to be useful.

NEURASTHENIA. (*See* EXHAUSTION.)

NIGHTMARE.
Bromide of potassium, 155.

NIGHT SCREAMING.
Bromide of potassium, 155. In children's attacks of night screaming often associated with squinting. Digestive organs to be attended to also.

NIPPLES, SORE.
Arnica, 317. The cerate.
Brandy-and-water, 201, 354. To be used as lotion before delivery and after each sucking to *prevent* cracking. Nipples should be washed and dried immediately after child is removed.
Collodion, 317. Sometimes applied to chapped nipples.
Glycerine of starch, 317; or this with eau de Cologne.
Lime-water, 201. As lotion.
Sulphurous acid, 170. Solution neat or diluted, constantly applied.
—— 317. With equal quantity of glycerine as lotion.
Zinc shield, 201. Constantly worn.

NODES. (*See* PERIOSTITIS.)
Iodide of potassium, 143, 147. As ointment in conjunction with internal use.
Mercury, oleate of, 260. Externally very valuable.

NOSE, DISEASES OF.
Ammonia, 195. Inhalations, in pain and inflammations of nose and frontal bones.
Cod-liver oil, 325. For chronic discharge.
Glycerine of tannin, 335, 336. For brushing out inside of nose when excoriated after measles, scarlatina, etc. Also for impetiginous eruptions of inside of nose, most severe where hair grows—epilation sometimes needful. Glycerine of starch or zinc ointment, applied often, is a good supplementary application.
——336. In the discharge of greenish-black stinking mucus.
Iodoform, 396.

NOSE-BLEEDING. (*See* EPISTAXIS.)

NUTRITION, IMPAIRED.
Cod-liver oil, 325, 326 *et seq.* Especially in children.
Lime, 204. As lime-water or carbonate of lime. Small doses as good as large.

NYMPHOMANIA.
Bromide of potassium, 156. Large doses required, at least twenty grs. three times a day.
Camphor, 414.

OBESITY.
Alkalies, 184. Solutions of oxides or bicarbonates. Use very questionable.
—— 184. Liquor potassæ. This usually, however, fails.
Diet, Salisbury, 668, 669.
Thyroid extract, 661.
Turkish baths, modified form, 79.
gar, 165. A remedy to be strongly emned, as it only reduces obesity at xpense of serious injury to the body.

ŒSOPHAGUS, STRICTURE OF.
Nutritive enemata, 100. When swallowing impossible.

ONYCHIA. (*See* PARONYCHIA.)

OPHTHALMIA.
Alum, 226. Eight grains to one ounce applied every *quarter* or *half* hour in simple and especially in purulent ophthalmia of children.
Antimony, 289. As tartar-emetic 1-36th to 1-48th grain three or four times a day in strumous ophthalmia. Sharp purgation at commencement useful.
Carbonic acid gas, 115. Said to relieve pain and photophobia of scrofulous ophthalmia when applied to the eye.
Cocaine, 599. In gonorrhœal ophthalmia.
Cod-liver oil, 325. When strumous.

OPIUM, DISAGREEABLE SYMPTOMS OF. (*See* POISONING BY OPIUM.)

ORCHITIS.
Antimony, 288. As tartar-emetic in acute orchitis. (*See* Inflammation.)
Ice locally applied, 89. Also in neuralgia of the testis.
Mercury, oleate of, 261. In syphilitic orchitis.

OTITIS. (*See* EAR, DISEASES OF, and OTORRHŒA.)

OTORRHŒA. (*See also* EAR, DISEASES OF.)
Aconite, 475. In otitis.
Alum, 226. Strong solution (sixty grains to one ounce) but inferior to glycerine of tannic acid.
Cod-liver oil, 325. When chronic.
Glycerine of tannin, 336. Meatus to be filled and plugged with cotton-wool—not in acute inflammation of meatus.
Hydrastis, 590.
Lead, 243. Solutions of acetate or diacetate as injection, especially when acute stage just subsided—in later stages stronger astringents needed.
Lime-water, 202. As a wash when active inflammation present. In chronic cases far inferior to astringents such as glycerine of tannin.

OVARIAN NEURALGIA.
Gelsemium, 523. Said to be useful.

OVARIAN TUMOURS.
Iodine, 134. Ten oz. of tincture injected after tapping.

OVERWORK.
Bromide of potassium, 153. When insomnia, bad dreams and irritabilty.
Opium, 566. A drop of laudanum with two of tinct. nucis vom. three or four times a day for headaches with flushings and dyspepsia, etc.
Phosphate of lime, 207. May be combined with phosphate of iron and carbonate of lime. A grain of each for a dose.

OVERWORK—*continued.*

Phosphorus, 316. In depression from overwork.
Sea-bathing, 54.
Sitz-bath, 75. For ten minutes at 70° to 80° on return from business tired and irritable. Half hour before dinner.

OXALURIA.

Mineral acids, 164. When eructations of sulphuretted hydrogen.

OZŒNA.

Acetate of alumina, 227. Irrigation.
Alum, 227. Nose to be well irrigated with a solution, a drachm to a pint.
Bismuth, 240. With equal quantity of Venetian talc in chronic non-syphilitic ozœna to be snuffed up after clearing the nose by strongly blowing it. Mercurial powders better.
Boric Acid, 173, 227. As injection.
Boroglyceride, 174. As injection.
Carbolic Acid, 227, 351. A weak solution as injection.
Glycerine of tannin, 227. Irrigation.
Iodine, 135. In chronic forms nose to be flushed with solution of salt containing a few drops tinct. iod.
Iodoform, 396.
Iron, 230. Spray of the subsulphate in chronic form.
Mercury, 263. White or red precipitate with 58 times its weight of sugar snuffed up after clearing the nose in the non-syphilitic form.
—— 263. Ointment of the nitrate in syphilitic form. (*See* Syphilis.)
Permanganate of potash, 227. Weak solution of.
Salol, 619. As snuff.
Tannin, 335. Or glycerine of tannin, even if syphilitic.

PAIN. (*See* COLIC, GALL-STONES, MYALGIA, NEURALGIA, ETC.)

Antifebrine, 623.
Antipyrine, 622.
Belladonna, 524, 537. Best remedy for every kind of pain in pelvic viscera (Anstie).
Bromides, locally, 148.
Carbolic Acid, 349. As local anæsthetic.
Chloral, 382. Sometimes relieves neuralgia, chronic rheumatism, gall-stones, colic, gastralgia, and even pain of cancer.
Chloroform, 365. Locally, generally inferior to other anæsthetics.
—— 365. Two or three drops on cotton-wool introduced into the ear for face-ache or toothache.
Vapour on raw surface of cancers, neuralgia of uterus, a photophobic eye, etc.
—— 369, *et seq.* As vapour to produce general anæsthesia. (*See* ref. for full directions.)
—— 374. Inhalation in renal and biliary colic, and other colic or pain.
Conium, 498, 501. In cancer, rheumatism, neuralgia, etc.
Ether, 90, 376, 378. As spray for local anæsthesia; also inhalation to produce general anæsthesia. (*See* ref.)
Exalgine, 624.
Hydrocyanic acid, 552. In gastric pain.
Ice and salt mixture for pain of operations, 90. Thus in paracentesis, etc.

PAIN—*continued.*

Iodine, 133. (*See* Myalgia.)
Iodide of potassium, 145. In nocturna pains of syphilis.
Iodoform, 396. A suppository in painful diseases of rectum and bladder.
Menthol, 415.
Methyl chloride spray, 90, 377.
Mustard, 430. For localized pain.
Opium, 554. Poultices containing laudanum used in inflammation. Linim. opii rubbed in relieves neuralgias, pleurodynia and myalgia; preparations of opium or morphia are applied to irritable, cancerous and simple sores.
—— 563. The hypodermic injection of morphia extensively employed to relieve pain. The unpleasant symptoms often accompanying its administration may usually be obviated by combining it with a twentieth part of atropia. At first not more than a sixth of a grain of morphia should be injected. A single injection sometimes cures recent and even long-standing sciatica and neuralgia. Useful in lumbago, pleurodynia and toothache. Occasionally required in pleurisy or pneumonia if the suffering is severe or persistent. Valuable in renal, biliary and intestinal colic.
—— 558. An injection of laudanum and starch useful in pain of bowels or organs near the rectum, such as cystitis or uterine diseases; opium and gall ointment excellent for painful bleeding piles and fissures of anus.
—— 568. In chronic cases it is best to try first all other methods of easing pain, as an opiate soon loses its influence.
Phenacetine, 623.
Plasters, lead, etc., 244.
Stramonium, 550. As ointment.
Tobacco, 495. Ointment made from.
Turkish baths, 76. Pain in seat of old wounds.
Warm injections, 99. Soothe the pain of cystitis, prostatitis, abscess of the prostate and pelvic, and abdominal pains generally.

PALPITATION.

Aconite, 475.
Camphor, 414. In nervous palpitation.
Eucalyptus, 420. At change of life.
Hot foot-bath, 68.
Musk, 420.
Sparteine, 494.
Strophanthus, 493, In cardiac failure.

PARALYSIS. (*See also* BRAIN, PARALYSIS OF.)

Calabar bean, 505, 506. In general paralysis of insane, also in progressive muscular wasting without much mental disorder. Also in some cases of long-standing hemiplegia; sometimes in paraplegia; locomotor ataxy, and writer's cramp.
Cannabis indica, 584. For retention of urine from spinal disease. For insomnia of general paralysis of insane, 585.
Counter-irritation, 110. By blistering fluid, in peripheral paralysis of seventh nerve.
Ergot, 589. Said to be useful in paraplegia.
Hyoscyamine, 547, 548. 1-50th gr. daily hypodermically, or 1-50th gr. night and morning by stomach in paralysis agitans and allied conditions. But symptoms recur on discontinuing drug.
Hyoscine, 540. In paralysis agitans.

PARALYSIS—*continued.*

NUX VOMICA, 576, 577. Or strychnia recommended by Brown-Séquard in paraplegia from softening and wasting of cord. Often useful in motor paralysis; also in alcoholic paralysis.
PHOSPHORUS, 316. In hysterical paralysis.
STRYCHNIA, 576. In all forms.

PARONYCHIA.

MERCURY, 258. As ointment applied for ten minutes every hour. Poultices at other times.
NITRATE OF LEAD, 258. Dusted on diseased tissues night and morning.

PARTURITION. (*See* CONFINEMENT.)

PEDICULI. (*See* LICE.)

PEMPHIGUS.

ARSENIC, 306. Largest dose five min. liq. arsenicalis three times a day, not on empty stomach. (*See* ref.)

PERICARDITIS. (*See* HEART, DISEASES OF.)

PERIOSTITIS. (*See* NODES.)

IODIDE OF POTASSIUM, 143. In syphilitic children; also in non-syphilitic periosteal thickenings.
MERCURY AND MORPHIA, OLEATES OF, 260. Locally.
SOFT SOAP, APPLICATIONS OF, 182.

PERITONITIS. (*See also* PUERPERAL PERITONITIS.)

OPIUM, 557. To quiet intestinal movements.
POULTICES, 83. Large, hot, and frequently renewed. Should be thin and covered with cotton-wool.

PERITYPHLITIS. (*See* TYPHLITIS.)

PERNICIOUS ANÆMIA.

ARSENIC, 298.
IRON. Of little use, 234.
RED BONE-MARROW, 663.

PERSPIRATION, EXCESSIVE.

ACIDS, especially sulphuric, 167.
AGARICUS, 509.
ATROPIA, 527. In sweating of phthisis and exhausting diseases. (*See* Phthisis.)
BELLADONNA, 526, 527. As liniment locally to affected part, also tincture internally especially in weakly children who perspire profusely. Also very useful where the perspiration has caused the skin of the feet to peel off, leaving the dermis red and tender.
COTO, 343.
ERGOT, 589. Said to arrest sweating.
HYOSCINE, 549. Checks the sweating of phthisis.
IODOFORM, 398.
LEAD, 244. As ointment of equal parts of emp. plumb. and linseed oil spread on linen and wrapped round the feet when they sweat—to be renewed every third day for nine days.

PERSPIRATION, EXCESSIVE—*continued.*

MUSCARINE, 509.
OILS, 320. Rubbed into the whole skin to prevent sweating accompanying exhausting diseases, as phthisis; but sponging with a weak acid better.
OPIUM, 569. As Dover's powder, may succeed after zinc has failed.
PICROTOXINE, 513. In $\frac{1}{150}$ or $\frac{1}{100}$ gr. dose.
PILOCARPINE, 513. In $\frac{1}{20}$ gr. doses thrice daily.
QUININE, 611. In exhausting diseases, as chronic phthisis. If a small dose fail, one of six or eight grs. at once or in portions, repeated hourly.
In many cases a night draught of quinine, sulphate of zinc, and sulphuric acid very useful.
—— 604. ʒj. in Oj. spirit for bathing skin.
SALICYLIC ACID, 614.
SILVER OXIDE, 255.
SPONGING, VERY HOT, 68. In phthisis.
SPONGING WITH ACIDULATED WATER, 161.
TANNIN OR GALLIC ACID, 340.
VINEGAR, 167. Dr. Graves' formula.
ZINC OLEATE, 416. With thymol.
ZINC, OXIDE OF, 282. In two-grain dose nightly, to control profuse colliquative sweating.
—— As a local application as oxide or better as oleate, 281.

PHARYNGITIS. (*See* THROAT, SORE.)

PHLEBITIS.

A BLISTER, 109. Over course of inflamed superficial vein.

PHLEGMASIA DOLENS.

HAMAMELIS, 342.

PHOTOPHOBIA. (*See* EYE, DISEASES OF; *also* CONJUNCTIVITIS.)

PHTHIRIASIS. (*See* LICE.)

PHTHISIS. (*See* COUGH, HÆMOPTYSIS, ETC.)

ACTÆA, 465.
AGARICUS, 509. In night sweats.
ALCOHOL, 364. Brandy and milk before breakfast.
ARSENIC, 5. When red, smooth, clean, or "irritable" tongue.
—— 298. As cigarettes—caution required. (*See* ref.)
—— 292. Useful in the diarrhœa of phthisis.
—— 309. Probably diminishes temperature. Useful in chronic and in fibroid phthisis.
ATROPIA, 527. 1-200th to 1-100th hypodermically, or 1-70th to 1-50th, or even, in exceptional cases, 1-20th in pill, to check excessive perspiration.
BELLADONNA, 524. Liniment or plaster for hyper-sensitiveness of the muscles of the chest. Also internally and externally in sweatings, 527.
BENZOIC ACID, 422. As inhalation.
BISMUTH, 241. For diarrhœa of phthisis.
BLISTERS, 108, 109. In chronic or fibroid phthisis, avoid vesication as a rule.
BRANDY, 354. Or rum and milk before breakfast.
CANTHARIDES, 437.
CARBOLIC ACID, 348. Disinfection of sputa.

PHTHISIS—*continued.*

Chalk mixture, 204. In diarrhœa.
Chloride of calcium, 205.
Chloroform, 367. With glycerine or honey for the cough in fibroid phthisis.
Cod-liver oil, 325. Very valuable in nearly all forms of this disease, especially at commencement. (*See* ref.) Also combined with creosote, 328.
Conium, as inhalation, 498.
Coto bark, 343. To check sweating. Also asserted to be useful in diarrhœa.
Counter-irritation, 108, 109. Only to relieve pain in acute forms, as iodine liniment; quiets cough and diminishes expectoration in chronic or fibroid phthisis.
Creosotal, 347.
Creosote, 344, 345, 346. Tar, or carbolic acid to check expectoration. In full doses in non-febrile cases increases appetite. Also as inhalation.
Croton oil, 329. With or without liq. potassæ -as counter-irritant to chest. Caution must be used.
Enemata, 557, 558. Of starch and laudanum for the diarrhœa.
Eucalyptus, 426. Twenty drops of, inhaled for cough of chronic phthisis.
Gelsemium, 518, 523. For the cough.
Glycerine, 332. In last stage, with water as wash for dry, shiny mouth.
—— 333. For cough.
Guaiacol and guaiacol carbonate, 347.
Hypophosphites, 209, 210. Of lime or soda —should be given alone. Most useful in early stage and in young subjects. Also as Fellow's Syrup, 210.
Iodine, 109, 132. As liniment painted under clavicles in chronic forms to allay harassing cough and to check secretion.
—— 135. As inhalation in chronic phthisis to lessen expectoration and cough.
Iodoform, 398. In turpentine as spray. Also given internally.
Iodol, 399.
Ipecacuanha, 446. Spray to throat when bronchial asthma and emphysema combined with fibroid phthisis.
Mercury, 273. The hundredth of a grain of corrosive sublimate every two or three hours in diarrhœa.
Muscarine, in night sweats, 509.
Opium, 555. Or morphia in a viscid vehicle for cough, especially where this is due to inflamed condition of throat—morphia lozenges very useful here.
—— 558. For tubercular ulceration of bowels.
—— 569. As Dover's Powder for night sweats.
Phosphate of lime, 207. In diarrhœa.
—— 207. In chronic forms of phthisis with little or no fever.
Picrotoxine, 513. (*See* Perspiration, excessive.)
Pilocarpine, 513. (*See* Perspiration, excessive.)
Quinine, 610. In acute phthisis to reduce temperature.
—— 610. In acute and chronic phthisis to check fever and sweating. If a small dose fail, a dose of six or eight grs. administered at once or in portions repeated hourly.
Salicylic acid, 613. In five-gr. doses for foul breath and offensive expectoration.
Salol, 619.
Sea-bathing, 55. If chronic, with little or no fever, and without active deposition of tubercle.
Silver, nitrate of, 253. Sometimes injected into trachea.
Sponging, very hot, 68. For excessive perspiration. With dilute acids, 161.
Sulphides, 124. As natural waters.
Sulphuretted hydrogen, 124. Intestinal injection of, mixed with carbonic acid gas.
Sulphuric acid, 166, 167. With sulph. zinc, to check perspiration.
Sulphurous acid, 171. Inhalation, spray or fumigation in chronic phthisis.
Tuberculin, Koch's, 657. Modified form.
Turkish baths, 76. For the cough.
Vinegar, 167. With laurel water to check sweats.

PILES.

Aloes, 630. To gently relieve bowels.
Alum, 225. Bleeding from piles.
Bromide of potassium, 148. In five parts glycerine locally to ease pain.
Calomel, 338. As ointment.
Castor oil, 330.
Chlorate of potash, 222. ʒss. to ʒj. of saturated solution with five to ten drops of laudanum as injection when inflamed and painful.
Cold injection, 74. Half a pint before going to stool every morning.
Conium, 498.
Gallic acid, 338. With opium as ointment.
Hamamelis, 342. As lotion or injection as well as by mouth in piles, whether bleeding or not.
Hydrastis, 590. As a wash.
Ice, 89. Locally applied for pain after operation.
Lead, 244. As plaster for pain in back due to piles.
Nitric acid, 160, 161. Strong, applied to internal piles, also to granular or ulcerated piles. Half-ounce or one ounce to half a pint of water as lotion for bleeding piles, 161.
Opium, 558. Mixed with gall ointment, an excellent application for painful bleeding piles. Mild purgatives also required.
Rhubarb, 635. About ten grs. of the root to be chewed nightly if a laxative is needed.
Useful also in hæmorrhoidal swellings of pregnancy.
Sulphur, 119. Five to ten grs. with one drachm conf. senna in the morning as a laxative.

PITYRIASIS.

Borax, 177. Saturated solution locally, several times a day, in pityriasis of scalp. If not successful try it as glycerine of borax.
Glycerine of borax, 177, 332. In pityriasis of scalp.
Lead, 243. Liq. plumb. two ozs.; glycerine two ozs.; water four ozs. as lotion.
Mercury, 256, 257. Citrine ointment especially when pityriasis of hairy parts of face. Often well to add tar ointment, 260.
Sulphurous acid, 170. With glycerine in conjunction with warm baths.
Tannic acid, glycerine, lard, balsam of Peru and oil of bitter almonds, 338.

PITYRIASIS RUBRA.

Thyroid extract, 661.

PITYRIASIS VERSICOLOR.

Mercury, 258. The bichloride in solution, two grs. to the oz. of water, as a lotion.
—— 260. The oleate of mercury with ether applied with a camel-hair pencil.
Sulphurous acid, 170. The B.P. acid with glycerine; warm baths should also be employed.

PLACENTA, RETAINED.

Actæa, 465.

PLEURISY.

Aconite, 472. Has marked effect.
Antimony, 288. As tartar-emetic. (*See* Inflammation.)
Blisters, 107, 108. Large and flying after subsidence of inflammation and fever, to further absorption of the fluid. The vesication, if any, should be healed at once.
Cod-liver oil, 324, 325. In chronic form.
Gelsemium, 523.
Iodide of potassium, 144. To quicken absorption of inflammatory effusions.
Iodine, 132. As liniment to chest to promote absorption.
—— 134. Solution (weak at first) injected, after tapping the injection,—may contain other disinfectants.
Morphia injection, 564. Occasionally needed for severe pain.
Mustard, 430. To affected organs in pleurisy.
Packing, 57.
Pilocarpine, 513. To remove effusion.
Potash, 188. As liquor potassæ is occasionally employed in pleurisy to promote the absorption of the inflammatory formations, but it is unadvisable to use it long.
Poultices, 83. Large, hot, and frequently renewed.
Purgative salts, 217. ʒvj–℥j. sulph. magnes. in ℥j. water before food.
Sinapisms, 430. Large.
Veratrum viride, 452. Opinions differ as to whether it should be used in sthenic or asthenic forms.

PLEURODYNIA.

Actæa racemosa, 466. When pleurodynia due to uterine derangements.
Acupuncture, 104. At "corresponding spot" on opposite side.
Belladonna, 84, 524. Generally liniment best, sometimes the plaster better.
Blistering, 111. Sometimes strong vesication necessary.
Chloral, 385. Made liquid with equal weight of camphor or menthol, and rubbed gently in.
Ether, 84. As spray sometimes immediately and permanently removes pain.
Iodine, 132, 133. As a liniment.
Opium, 554. The liniment may be rubbed in, or sometimes a hypodermic injection of morphia may be necessary, 564.
Poultices, 83, 84. Very hot; followed by application of lint and oilskin; belladonna liniment generally better.

PNEUMONIA.

Aconite, 472. Has marked effect.
Antimony, 20. Small frequent doses of tartar-emetic when skin hot and dry—better here than aconite.
—— 288. At commencement. If patient weak must take alcoholic stimulants as well.
Blisters, 107, 108. (Use of flying blisters in.) Lessen the pain; should be used in moderation.
ne, 595. To strengthen heart. The alicylate for hypodermic use.
, 485. To strengthen heart. Also, hort pneumonia.
In adynamic pneumonia hypo-
y.
, 523.

PNEUMONIA—*continued.*

Morphia injection, 564. Sometimes needed for severe pain.
Musk, 429.
Mustard, 430. To affected organs.
Packing, 57. Some pack the chest only, renewing hourly.
Phosphorus, 316. Especially when typhoid symptoms.
Poultices, 83. Large and hot. To encircle whole chest in children.
Quinine, 610, 611. To reduce temperature.
Serum treatment, 657.
Sinapisms, 430. Large.
Veratrum viride, 452. Opinions differ as to whether it should be used in sthenic or asthenic forms.

POISONING GENERALLY.

Apomorphia, 450. Hypodermically, [illegible] gr., to produce prompt emesis.
Mustard, 431.
Sulphate of zinc, 281. The best emetic.

POISONING BY ACIDS.

Alkalies, 182. The least irritating to the stomach to be selected.
Magnesia, oxide of, 198.

POISONING BY ACONITE.

Atropine, 543.

POISONING BY ALCOHOL.

Apomorphine, 450.
Cold douche, 72. Poured for some time from a height on to the head.
Cold water, 47. Smartly sprinkled on face.
Maintenance of temperature, 47.
Mustard, 430. Counter-irritation by.

POISONING BY ALKALIES.

Acids, 165. Dilute.

POISONING BY ALKALOIDS.

Bicarbonates of alkalies, 183, or magnesia.
Tannin, 339.

POISONING BY ANTIMONY.

Tannin, 284. Or strong tea or coffee; also stimulants.

POISONING BY ARSENIC.

Bicarbonate of magnesia, 198. Or other alkalies.
Charcoal, 113. Half an ounce or more.
Hydrate of iron, freshly precipitated, 112; or this in combination with magnesia.
Oxide of magnesia, 198.

POISONING BY BELLADONNA OR ATROPIA.

Alkalies, 183. Especially bicarb. of magnesia in poisoning by alkaloids.
Ammonia, 195. Breathed into air passages.
Charcoal, 113. In poisoning by belladonna. Half an ounce or more must be given.
Lime-water, 544. Has been recommended.
Physostigma, 540, 541. Doubtful.

POISONING BY BROMAL.

Atropine, 544.

POISONING BY CHLORAL.

Maintenance of temperature, 47.
Physostigma, 506.
Strychnia, 384. *The* antidote according to Liebreich.

POISONING BY CHLOROFORM.

Artificial respiration, etc., 372.
Atropine, 535. To prevent reflex inhibition.
Nitrite of amyl, 402.

POISONING BY CORROSIVES.

Oils and fats, 322.

POISONING BY FUNGI (MUSCARINE, ETC.).

Atropine, 509, 543.

POISONING BY IODOFORM.

Potassium bicarbonate, 397. In 10-gr. dose hourly.

POISONING BY LEAD.

Alkalies, 183. Especially bicarbonate of magnesia in poisoning by metallic salts.
Alum, 228.
Iodide of potassium, 144. In chronic cases
Lukewarm drinks, 245. Also sulphate of soda, sulphate of magnesia, of freshly precipitated sulphide of iron; promote vomiting—use stomach-pump—give milk with white of egg in *acute lead poisoning.*
Sulphides, 123. As baths in chronic form.

POISONING BY MERCURY.

Alkalies, 183, 198. Bicarbonate of magnesia best.
Baths, 266. Simple or sulphurous, with potassium iodide internally.
Charcoal, 113. In poisoning by corrosive sublimate, half an ounce or more must be given.

POISONING BY METALLIC SALTS.

Carbonates of alkalies, 183. Magnesia.
Sulphides internally, especially sulphide of iron (p. 123). Not if metallic solutions acid.

POISONING BY NITRATE OF SILVER.

Alkalies, 183. Especially the bicarbonate of magnesia.
Chloride of sodium, 210, 254.

POISONING BY OPIUM OR MORPHIA.

Ammonia, 195. Breathed into air passages.
Apomorphine, 450.
Atropia, 538, 539. Quarter to half a grain hypodermically.
Bicarbonate of magnesia, 183.
Bromide of potassium, 157. Controls disagreeable effects of medicinal doses of opium; 20 grs. an hour before, and the same dose two hours after, the opiate.
Charcoal, 113. Half an ounce or more.
Cocaine, 602. Internally.
Coffee, tea, 592.
Cold douche, 72. Poured for some time from a height on the head.
Cold water, 47. Smartly sprinkled on face.
Mustard, 430.
Nitrite of amyl, 407.

POISONING BY OPIUM OR MORPHIA —*continued.*

Stomach pump, 500. Rouse patient, keep him constantly moving to prevent sleep, give strong coffee, apply cold affusion to head, and if necessary adopt artificial respiration.
Tannin, 330.
For treatment of *Morphia Craving* see 571.

POISONING BY OXALIC ACID.

Lime, 202. Salts of.
Oxide of magnesia, 198.

POISONING BY PHOSPHORUS.

Copper salts, 317. Better than turpentine. Repeat till vomiting.
Transfusion, 313.
Turpentine, 317, 420.

POISONING BY PHYSOSTIGMA.

Atropia, 540. One-fiftieth to one-thirtieth of a grain hypodermically, repeated till effects evident.
Chloral, 384. *The* antidote.

POISONING BY PICROTOXINE.

Chloral, 384. *The* antidote.

POISONING BY PILOCARPINE (JABORANDI).

Atropine, 543.

POISONING BY PRUSSIC ACID.

Atropine, 544.

POISONING BY SALTS OF POTASSIUM, SODIUM, AND AMMONIUM.

Effect depends mainly on percentage dose. (*See* p. 139.)
Bleeding, 139.
Drinking freely, 139. To dilute blood.

POISONING BY SNAKE-BITE.

Alcohol, 363.
Ammonia, 196, 197.
Antivenene, 604.

POISONING BY STRYCHNIA.

Alkaline bicarbonates, 183. Magnesia best.
Bromide of potassium, 152.
Calabar bean, 580. As an antidote.
Charcoal, 113, 574. Half an ounce or more.
Chloral, 384, 580. *The* antidote.
Curare, 503.
Nitrite of amyl, 403. Inhalation.
Stomach pump, 574. If available before tetanic symptoms, *animal charcoal*, tannin solution of iodine, *chloroform inhalation*, injection of curare, or of methyl and ethyl compound of strychnia, of brucia, or of thebaia, artificial respiration, fats, etc.
Tannin, 339.
Tobacco, 497.

PREGNANCY. (*See* VOMITING.)

ACTÆA, 465. To prevent miscarriages in irritable or prolapsed uterus.
BROMIDE OF POTASSIUM, 155. For frightful delusions in later months. (For vomiting, 157.)
COCAINE, 602. Internally in vomiting.
IPECACUANHA, 163. Sometimes for acidity.
NUX VOMICA, 163.
SEA-BATHING, 52. In earlier months, unless there have been several miscarriages or the patient is of very excitable temperament.

PRIAPISM.

BROMIDES, 157.

PROGRESSIVE MUSCULAR ATROPHY.

STRYCHNINE, 576.

PROLAPSE OF RECTUM OR UTERUS.

ALUM, 226. In solution, six grains to the ounce, in prolapsus recti et uteri.
ERGOTIN, 589. Injections in prolapse of rectum.
ICE, 89. Locally applied in prolapse of rectum or uterus when parts inflamed.
STRYCHNIA, 578. In prolapsus recti, especially in children. If there is constipation nux vomica may be added to a purgative, as tinct. of rhubarb. If there is diarrhœa it should be checked.
SULPHUR, 120. In prolapsus recti has a beneficial effect in addition to that due to laxative properties.
TANNIN, 340. As catechu, kino, red gum, rhatany; hæmatoxylum injections to restrain prolapsus ani.

PROSTATE, ENLARGEMENT OF.

PROSTATE GLAND, 664.

PROSTATITIS.

CANTHARIDES, 436. A drop of the tinct (five may be required) three or four times a day.
HOT INJECTIONS, 99. To relieve pain.

PROSTRATION. (*See* EXHAUSTION.)

PRURIGO.

BORAX, 176. (*See* Pruritus.)
CANTHARIDES, 435. Internally.
CARBOLIC ACID, 350. Oil of cade, etc. (*See* Pruritus.)
CHLOROFORM, 365. As ointment to allay itching.
CYANIDE OF POTASSIUM, 551. Or hydrocyanic acid. (*See* Pruritus.)
ICE, 89. For prurigo of vulva.
IODOFORM, 397. As ointment. One drachm to the ounce.
SULPHUR, 119. With tar and benzoated lard as ointment in genuine prurigo.
TAR, 343.
TURKISH BATH, 79. When unconnected with lice.
WARM BATHS, 67.

PRURITUS.

ALKALIES, 176. An alkaline solution such as a drachm of carbonate of potash or soda to a pint of water applied with a small piece of sponge in itching of urticaria or lichen. Solution of cyanide of potassium, same strengh, better still.
ALUM, 181, 226. A strong solution for pruritus vulvæ.
ARSENIC, 293 *et seq.* In itching of the nose accompanying asthma-like affections. (*See* Asthma.)
BENZOIN, 422. The comp. tinct. painted on the skin in eczema, urticaria, etc.
BORACIC ACID, 173. As lotion in pruritus pudendi.
BORAX, 180. Five to ten grains to the ounce of hot water in pruriginous eruption on mucous membrane of vulva and vagina. In this complaint infusion of tobacco, iodide of lead as ointment, bismuth and morphia as ointment, chloroform as vapour, liniment or ointment; lead lotion; nitrate of silver; alum in solution, tannin in solution, are often useful, especially when alternated.
CAMPHOR, 411. An addition to dusting powders to allay heat and itching of eczema and intertrigo.
CARBOLIC ACID, 349. Solution as topical application, even when itching due to jaundice.
—— 343, 349. In chronic eczema, psoriasis and erythema, or better still, liq. carbonis detergens, oil of cade, or oleum rusci.
—— 350. A weak lotion (1 in 100) in pruritus ani et pudendi.
CHLOROFORM, 365. As ointment to allay itching of skin diseases.
COCAINE, 601. Lotions in pruritus ani et pudendi; also suppositories, 603.
COLD ANAL DOUCHE, 74.
CONIUM, 498. In pruritus ani, due to piles or other cause.
CYANIDE OF POTASSIUM, 551. A drachm in a pint of water as lotion for urticaria, lichen, eczema, and prurigo where the skin is unbroken.
HYDROCYANIC ACID, 551. Thirty drops of B.P. acid in an ounce of water or glycerine may be used instead of the cyanide of potassium solution, caution.
IODINE, 135. In itching of the nose or inner canthus, as an inhalation. (*See also* p. 394.)
LEAD, 243. Lotions ease itching of urticaria. A strong lotion useful in pruritus pudendi, especially where mucous membrane red and excoriated. If this is dependent on worms or tumour lotion useless.
MENTHOL, 257. Ointment in pruritus ani, vel vulvæ, also menthol soap, 181, 615.
MERCURY, 256. Strong solutions of bichloride, black wash, yellow wash or mercurial ointment in itching of skin affections.
  An ointment of a drachm of calomel to one oz. of lard is best, not however, in urticaria.
  Calomel ointment useful in pruritus ani, but less so in pruritus pudendi. In obstinate cases of these, blisters to thighs or leeches useful. Oleate of mercury, [illegible]
  Calomel ointment useful in itchy scabbiness of scalp and in pityriasis of scalp.
  Nitrate of mercury ointment will destroy lice, also the oleate of mercury, [illegible]
SALICYLIC ACID, 614. As ointment in pruritus ani et vulvæ.
SILVER, NITRATE OF, 252. To be painted every day or every second day on a patch of lichen the size of the palm causing excessive irritation. A weak solution often relieves pruritus ani et pudendi; apply well with camel-hair brush three or four times a day.
  A strong solution in pruritus of the meatus auditorius without eruption on skin; the memb. tymp. to be carefully avoided. If itching from dryness of ear or deficient secretion of wax, try first almond oil or glycerine.

PRURITUS—*continued.*

Tannin, 181. A strong solution in pruritus vulvæ.

PSORIASIS.

Arsenic, 305, 306. At first apparently aggravates the disease but soon heals it. According to Hunt, largest dose required five min. liq. arsen. three times a day—never on empty stomach. (For rules for giving arsenic *see* ref.)
Calomel ointment, 256.
Cantharides, 435. Internally.
Carbolic acid, 344, 350. Or, better still, liquor carbonis detergens, oil of cade, oleum rusci.
Copper, sulphate of, 278. Applied solid to spots of psoriasis, simple or specific, of the tongue.
Creosote, 343.
Mercury, 257. Calomel and nitrate of mercury ointment may be mixed, and tar ointment may be added, in patches of obstinate psoriasis, especially of hands, even when not syphilitic.
Oils and fats, 320. To lubricate skin; used in conjunction with warm baths.
Silver, nitrate of, 251. Or sulphate of copper. An occasional application useful in psoriasis of the tongue and mucous membrane of mouth. If these are syphilitic, mercurials best.
Soap, 176. Assists removal of scales.
Sulphides, 122. In baths—not in acute stage.
Sulphur, 121. Internally.
Tar, 343, 344. In obstinate forms may be painted on the patches and left on, or creasote ointment, petroleum, cade, and carbolic soaps of various strengths useful.
Thyroid extract, 661.
Turkish bath, 76.
Vaseline, 335. Locally.
Warm bath, 67. Especially in acute stage, rain or boiled water.

PUERPERAL FEVER, ETC.

Antimony, 288. As tartar-emetic for mania, but bromide and chloral better.
Antistreptococcic serum, 654, 655.
Bromide of potassium, 156. For mania.
Chloral, 381. For mania and convulsions.
Chlorine lotions to interior of uterus, 130.
Morphia, 565. Hypodermically, sometimes arrests puerperal convulsions.
Permanganate, 238. Has been given internally.
Turpentine, 410. Has been used.

PUERPERAL PERITONITIS.

Antimony, 288. As tartar-emetic. (*See also* Inflammation.)
Chlorine solution, 130. For washing out vagina.

PURPURA.

Arsenic, 142. When due to iodism.
Ergot, 588. Has been strongly recommended.
Hamamelis, 341.
Turpentine, 419. Has been used.

PYÆMIA AND SEPTICÆMIA.

Ammonium carbonate, 196. In typhoid condition.
Antistreptococcic serum, 655.
Permanganate, 238. Has been given internally.
Quinine, 610. Supposed to diminish temperature.

PYELITIS. (*See* CYSTITIS.)

PYROSIS.

Bismuth, 240. Useful in the various forms, whether acid, alkaline, or neutral.
Lead, 244. Soluble preparations are recommended.
Manganese, 238. Black oxide.
Nitric acid, 163, 164. Or hydrochloric acid in small medicinal doses shortly *before* meals when pyrosis acid,—*after* when pyrosis alkaline.
Sulphurous acid, 171.

QUININE ADMINISTRATION, SYMPTOMS OF.

Bromides, 157.

QUINSY. (*See* THROAT, DISEASES OF.)

RABIES. (*See* HYDROPHOBIA.)

RECTUM, DISEASES OF. (*See also* PROLAPSE OF RECTUM.)

Bromide of potassium, 148. Locally, in five parts glycerine, in fissures of rectum and painful growths.
Cocaine, 601. Suppositories and pessaries in painful conditions.
Iodoform, 390. As suppository in painful diseases.
Opium, 558.
Phosphorus, 316. In chronic inflammation.

REGURGITATION OF FOOD. SYMPTOMS COMPARABLE TO RUMINATION.

Ipecacuanha, 441.

RENAL COLIC. (*See* COLIC.)

RESTLESSNESS.

Aconite, 475. One drop of tincture at bedtime, repeated if needful.
Chloral hydrate, 383.
Warm sponging, 66. To induce sleep and calm restlessness of convalescence.
Sitz-bath, at 60°—80° Fah., pp. 55, 75.

RETENTION OF URINE.

Cannabis indica, 581. When from spinal disease.

RHEUMATIC GOUT. (*See* RHEUMATOID ARTHRITIS.)

RHEUMATISM, ACUTE.

Acid steam-bath, 79. Relieves pain and checks perspiration.
Aconite, 474. Often subdues pain in inflamed joints and perhaps shortens the fever.
Actæa racemosa, 465. Has been much used, said to quell the pain speedily.
Acupuncture, 104. At "corresponding spot" on opposite side, to relieve pain.
Antipyrine, 621, 622. Cannot compare with salicylate.
Benzoic acid, 424. Inferior to salicylic acid.
Bicarbonate or citrate of potash, 186.

RHEUMATISM, ACUTE—*continued.*

Opinions very divergent. Seems, however, to relieve pain.
Blistering, 110. Large flying blisters in proximity to inflamed joint, as adjuvants.
Cold-water treatment, 63. Invaluable in hyperpyrexia.
Cold wet compress, 57. To painful joints.
Conium, 501. Internally to relieve pain.
Lime-juice, 167. Eight ozs. daily; lemon-juice inferior.
Nitrate of potash, 221. In large doses (half oz. to one oz. in the day) freely diluted in water or lemonade—thought highly of by some.
Opium, 568. Hypodermically to relieve pain and induce sleep.
Packing, 57. If patient cannot be moved front of body may be packed.
Poultices, 83, 84. Very hot, on the painful part.
Quinine, 610. Recommended by some. (*See* ref.)
Salicine, 616, 617. Thirty grains every two hours, or even hourly at first. Improvement generally in one or two days, and course of fever much shortened. Mitigation of pain first sign of improvement. Liable to relapse.
Salicylate of soda, 616, 617. Behaves as salicine. Also used locally to joints.
Salicylic acid, 616, 617. Behaves as salicine, but is very slightly soluble and liable to impurities.
Salol, 619.
Sulphurous acid, 171. After fumigation, patient to be covered with bed-clothes which have been exposed to strong fumes, this produces perspiration, sleep, and relief.
Tepid or cold sponging, 57. If prejudiced against packing.
Turkish bath, 77. For modified forms, *see* p. 79.
Veratria, 452. Veratrum viride as tinct. is said to be useful.
—— 452. As ointment to rheumatic joints. It often, however, fails.

RHEUMATISM, CHRONIC.

Alkaline baths and fomentations, 178.
Antipyrine, 622. Hypodermically.
Blistering, 111. Nightly in gonorrhœal form.
Brine baths, hot, 68, 211. At Droitwich, also home baths.
Camphor, 411.
Capsicum, 432. A strong infusion applied on lint for rheumatic pains.
Carbonic acid, 115. Natural waters containing much carbonic acid used externally.
Chloral, 383. Often relieves the pain.
Chlorides, 212. As saline waters in chronic rheumatic affections.
Cod-liver oil, 326.
Cold douche, 74. Salt may be added.
Diet, Salisbury, 668, 669.
Galvanism, 79. For pain and stiffness.
Guaiacum, 463.
Ice and salt, 90. Apply for six minutes to diseased joints, then replace for short time by pounded ice.
Iodide of potassium, 144. Especially when pain worse at night, or of syphilitic origin.
Iodine, 132. Paint round joints.
Lamp-bath, 79.
Menthol, 416.
Mercury and morphia, oleate of, 260. For joint affections (locally)
Nitrate of potash, 221. Ten grains hourly or every two hours when urine scanty and high-coloured, becoming turbid on cooling.
Oil of mezereon, 424. And of sassafras reported useful.
Packing, 57.
Petroleum, 335.
Poultices, 83. In so-called rheumatic pains attacking one part of the body.
Salicylate of soda, 617.
Salol, 619.
Sulphides, 122. As baths.
Sulphur, 121. Locally applied. Internally in chronic and muscular rheumatism.
Turkish baths, 78, 79. Generally, and for circumscribed stiffness in shoulder.
Hot followed by cold sponging may be used as substitute.
Veratria, 455. As ointment to rheumatic joints; often fails.
Volatile oils, 421.

RHEUMATOID, OR RHEUMATIC ARTHRITIS.

Actæa racemosa, 465. Especially when connected with uterine derangement—also in other cases. (*See* ref.)
Arsenic, 290. As a bath containing four ozs. washing soda, and twenty grs. arseniate of soda.
—— 311. Large doses continued for some time at times of great benefit, but action capricious.
Brine baths, hot, 68.
Bromide of potassium, 157. Sometimes allays the severe pain.
Cod-liver oil, 326.
Cold douche, 74. May be slightly warmed in winter, use for one or two minutes and rub dry.
Iodide of potassium, 145. Sometimes large doses required, 147.
Iodine, 136. Tinct. or liquor internally.
Sulphides, 122. In baths.
Turkish baths, 79. In mild and chronic forms.

RICKETS.

Arsenic, 314.
Cod-liver oil, 326.
Cold sponging, 71. If the child is weak or very impressionable he should be allowed to stand up to the ankles in warm water before a fire while being sponged.
Iron, 234. Must be continued a long time.
Lime, 204. As lime-water or carbonate of lime.
Phosphate of lime, 207, 208. Small doses as good as large. Time for administration, 208.

RINGWORM. (*See* TINEA.)

SALICYLATE, SYMPTOMS OF ADMINISTRATION OF.

Bromides, 157.

SALIVATION.

Acids, 162. As astringents in salivation. Small medicinal doses.
Alcohol, 354. Diluted, as gargle.
Atropia, 529. Hypodermically.
Belladonna, 528.
Bromide of potassium, 153. For salivation of pregnancy.

SALIVATION—*continued.*

Chlorate of potash, 222. Whether mercurial or simple salivation.
Chlorine solution, 130.
Coto bark, 342.
Hyoscine, 549.
Iodide of potassium, 143. Sometimes beneficial in mercurial salivation, but sometimes aggravates it.
Iodine, 136. Gargle, two drachms of tinct. to eight ozs. of water.

SARCINÆ.

Sulphites, 172. Also hyposulphites have been employed to destroy sarcinæ and torulæ in the stomach. Sulphurous acid more effectual.

SCABIES. (*See* ITCH.)

SCALDS. (*See* BURNS.)

SCARLET FEVER.

Aconite, 473. To control accompanying inflammatory affections. Should be given if during convalescence any rise of temperature occurs.
Antistreptococcic serum, 665.
Arsenic, 6. With nitric acid in convalescence if "strawberry" tongue persists.
Belladonna, 537. Has been recommended as a preventive.
Carbolic oil. A weak solution of, rubbed in, 320.
Carbonate of ammonia, 197. In three or five grain doses hourly or every two or three hours in all forms, especially if given early.
Chlorate of potash, 222. In dryness of mouth after.
Chlorine water, 130. In sloughing of throat.
Cod-liver oil, 325. In sequelæ of scarlet fever.
Cold bath, affusion, etc., 59, 62, 72. During first few days when skin hot and red.
Cold wet compress to throat, 57. Throughout whole course, renew every three hours.
Eucalyptus oil, 320, 321, 425. Solution in oil, for inunction.
Fat, 320. Rub hands and feet with a firm fat to remove heat and tightness produced by rash.
Some anoint whole body two or three times a day with fat or oil, such as almond oil, to prevent desquamation, sequelæ and diffusion of branny particles of the skin.
Ice, 89. Sucking, for the sore throat, especially at beginning.
Ice poultice, 89. To throat.
Juniper, 424. Esteemed as a diuretic in scarlatinal dropsy.
Mercury, 275. The third of a grain of grey powder every hour has marked effect on inflamed tonsils.
Mustard, 431. A general mustard bath on the recession of rash to bring it back.
Nitric acid, 162. Strong, to sloughs in throat.
Packing, cold or tepid, 56. Throughout its course, especially on recession of rash; douching after pack has been recommended.
Permanganate, 238. Has been given internally.
Salicylic acid, 616. And salicylate of soda to lessen temperature. Not much used now.

SCARLET FEVER—*continued.*

Strychnia, 576, 577. Hypodermically for paralysis after scarlet fever.
Sulphate of magnesia, 218. And other purgatives to prevent sore throat and other sequelæ.
Sulphurous acid, 171. Inhalation, spray or fumigation in malignant sore throat.
Veratrum viride, 452. Has been employed in convulsions.

SCIATICA.

Aconite, 467. As ointment, generally belladonna better.
Actæa, 465.
Acupuncture, 84, 90, 103. Along the course of sciatic nerve, often cures long-standing cases. Must puncture deeply.
Antipyrine, 622. Internally.
Atropia, 524, 537. Hypodermically, but generally morphia better.
Belladonna, 524, 537.
Brine baths, 68. At Droitwich and at home.
Chloride of ammonium, 211.
Chloroform, 374. Inhalation.
Conium, 502.
Counter-irritation, 109. Free vesication by cantharides—acupuncture sometimes very serviceable.
Ether, 90, 377. As spray, sometimes removes pain permanently—generally only temporarily.
Exalgine, 624.
Galvanism, 83, 84.
Guaiacum, 403.
Iodide of potassium, 144. Sometimes relieves, but often fails.
Methyl chloride, 377. As spray.
Morphia, 563. A single hypodermic injection sometimes permanently cures long-standing cases. If not it may be repeated every second day or so.
Needle, 103. On the sciatic nerve.
Poultices, 83. Applied very hot.
Salicylate of soda, 618.
Salol, 619.
Sulphur, 121. Locally.
Turkish baths, 76.
Turpentine, 419. In half-ounce doses for four or eight successive nights, has been very successful.
Veratria, 454. As strong ointment. Veratrum viride as tinct. has also been recommended, 453.

SCREAMING AT NIGHT. (*See* NIGHT SCREAMING.)

SCROFULA. (*See* SORES.)

Blisters, 110. For scrofulous glands.
Calomel, 258. As ointment for sores.
Chloride of calcium, 205. Ten to twenty grain doses in milk after food when glandular enlargement of neck and chronic diarrhœa.
Cod-liver oil, 325. Of great service in the various manifestations of this disease, as chronic discharge from ears and nose, strumous ophthalmia, strumous disease of bones, abscesses, etc.
Iodine, 133. Tinct. or ointment applied over scrofulous glands—take care not to increase inflammation.
Iodoform, 396.
Iron, 234. Must be long continued.
Phosphate of lime, 207. Of great use for scrofulous sores.

SCROFULA—*continued.*

Soft soap, 182. As application in acute and chronic inflammations, mesenteric disease, caries, and periostitis, when of a scrofulous nature.
Sulphides, 126, 127. For sores, abscesses, suppurating glands. (*See* ref.)

SCURVY.

Acids, 167. Especially vinegar to prevent scurvy in the absence of lime-juice or fresh vegetables.
Alcohol, 354. Diluted as gargle.
Atropia, 529. Hypodermically.

SEA-SICKNESS. (*See also* VOMITING.)

Bromides, 157.
Chloral, 384.
Chloralamide, 386.
Chloroform, 306. Drop doses of pure chloroform.
Cocaine, 603. Use requires caution.
Nitrite of amyl, 405. Inhalation for prevention of sea-sickness. Internally for a peculiar affection allied to sea-sickness.
Nitro-glycerine, 409.
Spinal ice-bag, 92.

SEMINAL EMISSIONS. (*See* SPERMATORRHŒA.)

SENILE DECAY.

Cod-liver oil, 324. With phosphorus.
Phosphorus, 316. Many cases improve.

SEPTICÆMIA. (*See* PYÆMIA.)

SEROUS EXUDATIONS. (*See* SYNOVITIS, PLEURISY, PERICARDITIS, ETC.)

SEXUAL DESIRE, INORDINATE. (*See also* NYMPHOMANIA.)

Bromides, 156.
Camphor, 414.

SEXUAL WEAKNESS. (*See* IMPOTENCE.)

SHINGLES. (*See* HERPES.)

SICK HEADACHE.

Aconite, 467. The ointment to be rubbed over the painful brow at commencement.
Antipyrine, 622. Highly useful.
Bitters, the purer ones, 626.
Bromide of potassium, 154. When associated with "nervous" state, which it often is at the "change of life."
—— 154, 393, 394. When due to uterine disorder.
Caffeine, 595. As effervescing citrate useful in sick headache; also as hydrobromate.
Cannabis indica, 584. Especially valuable in preventing attacks when from fatigue, etc., they become unusually frequent. Useful where much or little sickness, also sometimes in the severe continuous forms. One-third to half a grain of the extract at commencement of attack will sometimes cut it short.
May be combined in pill with iron or aloes.

SICK HEADACHE—*continued.*

Chamomile, 627. A popular remedy.
Chloride of ammonium, 211.
Cocaine, 602. Internally.
Croton-chloral, 391. Especially in the milder forms without severe vomiting and retching. Often bromide useful afterwards.
—— 394. When the headache predominates.
Exalgine, 624.
Friedrichshall water, 214. A wine glassful in a breakfast cup of hot water for bilious sick headache.
Mercury, 276. As blue pill.
Nitrite of amyl, 405. As inhalation.
Nitrite of soda, 411.
Nitro-glycerine, 409. A tablet every hour immediately headache begins. May be given in non-paroxysmal period—often successful, but frequently fails.
Nux vomica, 572. A drop of the tinct. very frequently in acute gastric catarrh with much headache and slight nausea.
Phenacetine, 623.
Phosphorus, 316.
Podophyllum, 461. When there is either diarrhœa or constipation, with dark-coloured motions. If the diarrhœa is of a light colour the hundredth part of a grain of bichloride of mercury three times a day.
Salicylate of soda, 618.
Saline purgatives, 215.
Valerianate of zinc or of ammonia, 427. In two to five gr. doses three times daily.
Veratria, 455. The ointment to be rubbed over the painful brow at commencement.
—— 455. As ointment where tenderness of skin present. It often subdues pain, prevents vomiting, and shortens the attack.
Zinc oxide, 282.

SICKNESS. (*See* VOMITING.)

SKIN AFFECTIONS, ACUTE.

Poultices, 85. Especially starch poultices.

SKIN AFFECTIONS, CHRONIC.

Alkaline baths, 178.
β-Naphthol, 625.
Cod-liver oil, 326. When syphilitic or otherwise.
Counter irritants, 110.
Turkish bath, modified, 79.
Warm and hot baths, 67.

SKIN, TORPID.

Acids, 161. Greatly diluted nitric or hydrochloric, as bath.

SLEEPLESSNESS.

Alcohol, 356, 359. In fevers, if it produce sleep and quell delirium.
Bromide of potassium, 153. Especially when delirium like that of delirium tremens or accompanying mental anxiety, hysteria, pregnancy, and general nervous irritability. Dose 20 to 30 grs. It increases hypnotic effect of henbane, Indian hemp, ether and chloroform.
Cannabis indica, 583. Rather uncertain. In senile insomnia marked by great restlessness, 585.
Choral, 380, 381. In old people, in delirium tremens, paralysis of insane, acute mania, puerperal mania, puerperal convulsions, typhus, phthisis, convulsions of children.
Chloralamide, 386.

SLEEPLESSNESS—*continued.*

CODEIA, 570. And narcein, both soporifics.
COLD DOUCHE, 73. A large sponge soaked with cold water, iced if possible, is dashed against the head, face, and chest several times. The skin is then rubbed dry with a towel. Also cold affusion, 74.
CROTON-CHLORAL, 395. One drachm may be given.
DRIP-SHEET, 58.
DUBOISIA, 551.
ETHER, 377. Or spirits of chloroform in a full dose.
GELSEMIUM, 522. In insomnia of mania, of drunkards, and of over-excitement.
HOT SPONGING TO SPINE, 75.
HYOSCYAMUS, 547–549. When opium disagrees.
MORPHIA, 562. Hypodermically injected in acute mania, delirium tremens, chorea, etc., 564.
OPIUM, 558. A rectal injection sometimes succeeds best, *e.g.*, for dyspeptics or convalescents from acute disease, also used in delirium tremens and traumatic delirium.
—— 561. In fevers.
The time of administration important—should be given so as to act at the time when the patient is naturally inclined to doze.
It should not be given in chronic sleeplessness independent of any very notable disease, chloral and bromide of potassium much better in dyspepsia and uterine derangements.
PACK, THE WET, 57.
PARALDEHYDE, 386, 387.
PHOSPHORUS, 316. When depending on cerebral anæmia—also in the aged.
REMOVAL INLAND, 53. When restlessness at night is produced by sea-bathing.
SITZ-BATH, 55, 75. At 60° to 80°.
SULPHONAL, 389.
TARTAR-EMETIC, 288. In the delirium of typhus and other fevers.
TRIONAL, TETRONAL, 390.
URETHANE, 388.
WARM BATH, 66, 67. Or sponging, in fever and convalescence.
—— 67. In inflammatory affections.

SMALL-POX.

COCAINE, 602.
COLLODION, 262, 318. Or solutions of india-rubber or gutta-percha in chloroform prevent pitting in small pox.
LIME, 202. Cotton-wool cut in proper shapes is dipped into lime liniment and applied to face and neck to prevent pitting.
MERCURY, 262. Formerly used in ointments or plasters to prevent pitting.
PACKING, 57. Especially on retrocession of rash.
SILVER, NITRATE OF, 250. By fourth or fifth day puncture vesicles with needle dipped in solution 20 grs. to 1 oz., or simply paint the skin. The plan prevents pitting.
VACCINATION—Reference to, 652.

SNAKE POISON.

AMMONIA INJECTIONS, 196, 197. (Foot-note.)
ANTIVENENE, 654.

SNEEZING.

ARSENIC, 298, 299, *et seq.* A drop of the liquor three times a day in paroxysmal sneezing allied to asthma.

SNEEZING—*continued.*

CAMPHOR, 412. In incessant sneezing with profuse running from eyes and nose. The powder should be sniffed or the alcoholic solution inhaled.
IODIDE OF POTASSIUM, 142. In paroxysmal sneezing 10 grs. several times a day.
IODINE, 135. Inhalations in paroxysmal sneezing with itching at the nose.
MENTHOL, 416.

SOFTENING OF BRAIN. (*See* BRAIN PARALYSIS.)

SOMNAMBULISM.

BROMIDE OF POTASSIUM, 155. In the somnambulism of children, which is allied to epilepsy.

SORDES ON LIPS, TONGUE, ETC.
Glycerine, 332.

SORE FEET.

WASHING SODA, 178. A tablespoonful in half a gallon of warm water as foot-bath, for half an hour in tenderness of soles.

SORE NIPPLES. (*See* NIPPLES, SORE.)

SORES. (*See also* ULCERS.)

ACIDS, in concentration if sloughing sores, 160, 161.
ALCOHOL, 354. To cover sores with thin protecting layer of coagulated albumen.
ALUM, 225. Dry or in solution to relaxed and abundantly secreting sores.
ANTISEPTIC TREATMENT OF, 82, 86. With saturated solution of boric acid or other suitable antiseptic.
CAMPHOR, 411. For dusting on indolent sores.
CARBOLIC ACID, 302, 349. Applied as stimulant and antiseptic, and anæsthetic, 351.
CAUSTIC ALKALIES, 175. Applied to hard edges.
CHARCOAL, 86, 112. Locally to sloughing or unhealthy sores.
CHLORIDE OF LIME, 86. Added to poultice for offensive gases.
CHLORINE SOLUTION, 130. For sloughing and indolent sores, as a wash.
CINCHONA, 604. The powdered bark dusted over sloughing ulcers, etc.
CONIUM, BELLADONNA, ETC, 86. As sedatives.
COPPER, 277. The sulphate as stick, solution, or ointment to indolent sores.
GLYCERINE OF CARBOLIC ACID, 333. A good application to fœtid sores.
HAMAMELIS, 341. On lint or cotton-wool, when oozing.
IODIDE OF POTASSIUM, 147.
IODIDE OF STARCH, 87. As a poultice, cold. (*See* ref.)
IODINE, 136. Sores of throat, syphilitic and simple.
IODOFORM, 396. Dusted over spreading or sloughing sores.
IODOL, 399. Dusted over sores prevents suppuration. Very useful in syphilitic and gangrenous sores.
LEAD, 242. The soluble salts as lotion to unhealthy over-secreting sores.
LIME, 201. As carbonate or lime-water to check discharge.

SORES—*continued.*
Mercury, 258. Calomel ointment or black wash in scrofulous or tubercular lupus, and in open scrofulous sores.
—— 262. In syphilitic sores.
Nitric acid, 161. To surface of unhealthy and indolent sores.
Opium, 554. Or morphia with glycerine as an application to cancerous or simple sores, to relieve pain.
Phosphate of lime, 207.
Sulphide of calcium, 126. When thin ichor discharged.
Sulphur ointment, 116.
Tannin, 338. Or glycerine of tannin to coat over wounds and profusely discharging sores.
Yeast, 86. As poultices, in sloughing sores.
Zinc, sulphate of, 280. To unhealthy freely secreting sores.

SORE THROAT. (*See* THROAT, DISEASES OF.)

SPASMODIC AFFECTIONS.
Aconite, 470. In spasmodic laryngitis rapidly produces good effects.
Alcohol, 363. As an antispasmodic.
Ammonia, 195. Useful in children's intestinal colic, etc.
Camphor, 414.
Chloroform, 365, 375. Vapour in spasm of intestines; also in other spasmodic troubles.
Hot sand, chamomile flowers or heated tile, 88. Locally in painful "spasms."
Ipecacuanha, 438.
Opium, 557. Very useful as an antispasmodic, especially if given with a stimulant, as alcohol, ether, or chloroform, 566.
Sulpho-carbolates, 352. In flatulent "spasms."
Volatile oils, 423.

SPERMATORRHŒA.
Belladonna, 538. A quarter grain of the extract with one-and-a-half grain zinc sulph. three or four times a day, often successful in cases of nocturnal seminal emissions.
Bladder to be emptied after first deep sleep, 157.
Bromide of potassium, 156. Supplemented by cold sponging of scrotum and perinæum and suspension of testes in water; use of a hard mattress and abstention from suppers; patient to be waked up after six or seven hours' sleep.
Cantharides, 437. With iron internally in emissions.
Cold douche, 74. To perinæum and buttocks with suspension of testicles in cold water.
Cold sponging, 72.
Digitalis, 488. One or two drachm doses of the infusion very efficacious.
Hyoscine, 549.
Hypophosphites, 209. Of lime or soda.
Phosphorus, 316. For physical or mental debility induced by spermatorrhœa.
Quinine, 611. Has been recommended.
Strychnia, 578. In large doses, especially when associated with impotence.

SPINAL IRRITATION.
Aconite, 467. As ointment.
Belladonna, 467. Preparations locally applied generally better than those of aconite.

SPINAL PARALYSES. (*See* PARALYSIS.)

SPRAIN.
Camphor, 411.
Cold douche, 74. Salt may be added. The force must be regulated by condition of tissues.
Hot bath, 68.

STATUS EPILEPTICUS. (*See* EPILEPSY.)

STIFFNESS. (*See* MUSCLES.)

STINGS.
Ammonia, 194. Weak solutions in stings of insects to neutralize the formic acid.

STOMACH, DISEASES OF. (*See also* VOMITING.)
Acids, 163. Nitric or hydrochloric in small doses for acid eructations, heartburn, and discomfort in chest and epigastrium due to excess of acid in stomach.
Alkalies, 182. In pain of stomach. Liquor potassæ generally used.
Ammonia, 195. Internally as an excitant when functions of stomach and upper intestines depressed.
Arsenic, 291. A drop of liq. arsen. before food in irritative dyspepsia, and in vomiting of drunkards. Useful in chronic ulcer and cancer; also in heartburn and gastralgia, and in chronic dyspepsia with diarrhœa which is excited by food.
Belladonna, 531. In some painful affections.
Bichromate of potassium, 224. In dyspepsia and gastric ulcer.
Bismuth, 240. Especially the nitrate, eases the pain in both organic and functional diseases — as cancer, chronic ulcers, chronic inflammation, and especially chronic gastritis of drunkards, also in gastrodynia and cramp; acute and chronic catarrh of stomach in children causing vomiting yield to this, also the various forms of pyrosis.
Carbonic acid water, 116. In painful and irritable conditions, may be mixed with milk; useful where constipation.
Charcoal, 114. In ulcer of stomach, also in neuralgia (gastrodynia).
Chloral, 383. Sometimes relieves pain of gastralgia.
Chloroform, 366. Drop doses in flatulent distension, sea-sickness, and other vomitings.
Cocaine, 602. In form of pill averts vomiting and eases pain of disease of stomach.
Conium, 498. Sometimes relieves pain of cancer.
Counter-irritation, 110. At epigastrium often allays pain and obstinate vomiting due to disease of stomach.
Creosote, 345. Checks pains after food, also many forms of vomiting.
Eucalyptus, 426. In chronic catarrh and in vomiting from sarcinæ.
Glycerine, 333. ℥j. or ℥ij. in tea, etc., in flatulence and acidity.
Hydrastis, 590. In catarrh, especially alcoholic.
Hydrocyanic acid, 551. Much used in painful diseases, as chronic ulcer, cancer, chronic gastritis, gastralgia, etc. May check vomiting as well as relieve pain.

STOMACH, DISEASES OF—*continued.*

Ice-bag, 88. To epigastrium, for pain and vomiting in cancer, ulcer, etc.
Ice, 89. To suck in nausea, vomiting and gastric pain.
Iron, 232. Astringent preparations in hæmorrhage from stomach.
Koumiss, 116.
Lead, 244. Soluble preparations have been recommended in pyrosis.
Lime-water and milk, 202, 203. When disease.
Magnesia, 198, 190. As oxide and carbonate—action mild—very suitable for children—often combined with rhubarb.
Bicarbonate, or, as it is often called, fluid magnesia, is a useful and mild aperient.
Manganese, 238. Black oxide in gastrodynia and pyrosis.
β-Naphthol, 625. In dilated stomach as disinfectant.
Nutrient enemata, 100. In painful diseases as chronic ulcer, and when persistent vomiting.
Nux vomica, 572. One or two drops of the tinct. every two hours or oftener when tongue coated and there is chronic catarrh of stomach in the course of chronic disease, also when there is flatulence and indigestion, or heartburn.
—— 573. One drop every five or ten minutes for eight or ten doses in acute gastric catarrh with headache or sick headache.
Opium, 556. Or morphia, to quell pain of many stomach affections, and to relieve the vomiting, thus it is useful in cancer, chronic ulcer, and chronic gastritis from excessive indulgence in alcoholic drinks.
—— 556. For the pain, nausea, and want of appetite accompanying alcoholism, small doses of morphia combined with tonics very efficacious. For gastrodynia with heartburn, small doses of morphia with bismuth.
Salicylate of soda, 614. In gastralgia and fermentation in the stomach.
Silver, nitrate of, 254. Given in solution to check pain and vomiting of chronic inflammation, chronic ulcer, and even cancer.
Strychnia, 576. Hypodermically for gastralgia and gastrodynia.
Sulphites and hyposulphites, 172. To destroy sarcinæ and torulæ.
Tannin, 339. Sometimes given for irritative dyspepsia, also in hæmorrhage.
Turpentine, 417. In hæmorrhage from chronic ulcer, etc., five to ten drops frequently repeated.
Zinc, sulphate of, 281. In less than emetic doses in painful affections due to chronic inflammation of mucous membrane.

STOMATITIS. (*See also* MOUTH, DISEASES OF.)

Acids, 162. As astringents in ulcerative stomatitis; others, however, are preferable.
Alum, 226. In ulcerative stomatitis, applied dry with the finger many times a day, especially where disease affects one-half the jaw.
Boracic acid, 174. As lotion, one in fifty. Also in honey or glycerine.
Chlorate of potash, 222. In ulcerative stomatitis. Also chlorate of soda, 223.
Copper, sulphate of, 278. Solution painted over edges of gums in ulcerative stomatitis. Generally dry alum better.

STOMATITIS—*continued.*

Glycerine of tannin, 338. In ulcerative stomatitis.
Lime-water, 202.
Salicylic acid, 613. One part (dissolved in sufficient alcohol) to 250 parts of water eases pain of catarrhal stomatitis.

STONE. (*See* CALCULI.)

STOUTNESS. (*See* OBESITY.)

STRANGURY. (*See* MICTURITION, PAINFUL.)

STREPTOCOCCUS INFECTION.

Antitoxic serum, 655, 656.

STRICTURE.

Opium, 567. In spasmodic stricture.

STRUMA. (*See* SCROFULA.)

STUPOR, *e.g.*, FROM ALCOHOL OR OPIUM POISONING. (*See* COMA.)

SUNBURN.

Vaseline and petroleum, 335.

SUNSTROKE.

Cold affusion, 72. When patient struck down unconscious.

SUPPRESSION OF URINE. (*See* URINE, SUPPRESSION OF.)

SUPPURATION.

Quinine, 611. Has been recommended in profuse suppuration.
Sulphide of calcium, 124. When ichor instead of pus is secreted. It will also arrest suppuration, or, if that is impossible, will hasten maturation.

SUSPENDED ANIMATION AT BIRTH.

Cold water, 47. Smartly sprinkled on face.

SWALLOWING LIQUIDS, CONGENITAL DIFFICULTY IN.

Bromide of potassium, 149. When no diphtheria or malformation.

SWEATING. (*See* PERSPIRATION, EXCESSIVE.)

SYCOSIS.

Mercury, 260. Bichloride, two grains to one ounce of water applied as lotion after each epilation.
—— 260. The oleate.

SYNCOPE. (*See* FAINTING.)

SYNOVITIS.

BLISTERS, 111. A flying blister every night in chronic synovitis.
IODINE, 132. Painted round joint in chronic synovitis.
MERCURY AND MORPHIA, OLEATE OF, 259. Locally applied.
SOFT-SOAP, 182. Applications.

SYPHILIS. (*See* CHANCRE.)

COD-LIVER OIL, 324. In chronic skin affections.
IODIDE OF IRON, 237. Where anæmia.
IODIDE OF POTASSIUM, 143, 147. In secondary and tertiary syphilis. (*See* ref.) Large doses required for some syphilitic sores.
IODOFORM, 396, 397.
IODOL, 399. In secondary syphilis.
LAMP-BATH, 79.
MERCURY, 263. Corrosive sublim. half an ounce, ammon. chlor. one ounce, in a bath for obstinate rashes.
—— 262. Black wash very useful in syphilitic sores generally, in mucous tubercles, and in the elevated indurations, larger and more irregular than mucous tubercles occurring near the anus of children. Calomel or citrine ointment may be substituted for black wash.
Calomel dusted over condylomata will remove them, 263.
The cynanide, ten to fifteen grains in an ounce of water, may be applied to rashes and sores on throat, tongue, penis, anus, etc. For those on the prepuce five grains to the ounce quite strong enough. Should be applied with soft brush to chancres, and these should be kept moist with lint soaked in black wash, 263.
Mercurial applications mixed with tar, etc., are useful in syphilitic psoriasis, 263.
Mercurial fumigations, moist or dry, for eradicating syphilis. These sometimes produce prostration. Mercurial baths, 263.
—— 264. Mercurial and calomel ointments may be rubbed into delicate parts of the skin to mercurialize the system.
Bichloride has been injected subcutaneously.
In syphilitic ozœna nitrate of mercury ointment, partially melted, may be applied twice a day after nose well cleared, 263.
For discussion on the use of mercury in syphilis, *see* 264, 273. Hypodermic use, etc.
—— 260. The twenty per cent. ointment of the oleate in the axilla useful for both children and adults.
NITRIC ACID, 167. In secondary syphilis.
OILS OF MEZEREON AND SASSAFRAS, 424. Reported useful.
SOFT-SOAP, 182. Applications in glandular swellings.
TURKISH BATHS, modified form, 79.
ZINC, 279. Chloride, iodide, nitrate, locally to syphilitic ulcers.

TAPE WORM. (*See* WORMS.)

TEETH, AFFECTIONS OF.

ACONITE, 466. Ointment or liniment for facial neuralgia due to diseased teeth; will succeed quickly if at all.
ARSENIC, 289. As escharotic to destroy pulp.
—— 290. When for pain, may be mixed with opium. It sometimes at first aggravates pain.
BROMIDE OF POTASSIUM, 152. For irritability and convulsions in teething.
CAMPHOR, 411.
CAPSICUM, 432. A strong infusion applied on lint for toothache.
CARBOLIC ACID, 349.
CHALK, as a tooth powder, 202.
CHLORAL, 385. Rubbed up with equal weight of camphor and rubbed gently in externally or put into cavity of tooth.
CHLOROFORM, 366. Two or three drops on cotton-wool in ear, or into tooth, or hold over hollow tooth a bit of rag moistened with chloroform.
—— 366. Equal parts of chloroform and creasote a good application.
COCAINE, 601. The citrate pressed into a painful cavity, and before removing tartar.
COLLODION, 318. Mixed with crystallized carbolic acid, which has been melted in a test-tube, may be inserted into a tooth with exposed and inflamed pulp on cotton-wool: the pain may be at first increased but is soon abolished.
CREOSOTE, 345. With tannin or opium into hollow of decayed tooth often gives relief.
CROTON-CHLORAL, 391, 396. Sometimes relieves toothache. Of use if with neuralgia.
GELSEMIUM, 513. In some forms of toothache.
HOT WATER, 93. Rinse with—sometimes cold better.
HYPOPHOSPHITES, 209. Of lime or soda in teething.
IODINE, 135. Tincture painted over gums close to teeth when these begin to recede and expose teeth. Also to remove tartar from teeth.
MENTHOL, 415.
MORPHIA, 564. Hypodermically injected for severe toothache.
OPIUM, 554. Mixed with tannin or creasote and inserted into the hollow of a painful tooth, where inflamed pulp exposed.
VOLATILE OILS, 421. In toothache.
ZINC, CHLORIDE OF, 281. To destroy exposed, painful pulp.

TESTIS. (*See* ORCHITIS; *also* GLANDS.)

TETANUS.

ANTITOXINS, 653.
BROMIDE OF POTASSIUM, 152.
CALABAR BEAN, 504. If possible by mouth, if not, hypodermically or by anus. It must be pushed till just short of arresting the breathing, and should be given at the very beginning. The liquid extract is used.
CHLORAL, 382. In large doses has sometimes cured.
CONINE, 501. Hypodermically.
CURARE, 502.
ETHER, 377. Spray to spine every two hours for tetanus.
GELSEMIUM, 522.
NICOTINE, 497. By rectum or hypodermically, appears to be useful in many cases.
NITRITE OF AMYL, 403. Inhalation may be tried, or it may be given subcutaneously.
SPINAL ICE-BAG, 92.
TOBACCO, 487.

THIRST.

Acid drinks, 92, 93, 159, 162. In fevers, promote secretion of saliva.
Hot water, rinsing the mouth with, 93.
Ice, 89. Sucking ice allays thirst.
Tepid drinks, 93. In diabetes.

THREAD WORMS. (*See* WORMS.)

THROAT, DISEASES OF.

Aconite, 470. In tonsillitis and acute sore throat, when temperature high, drop or half-drop doses of the tincture every quarter of an hour for two hours, then every hour, will almost certainly prove efficacious.
Alcohol, 354. Diluted, as gargle in relaxed throat, scurvy, salivation, etc.
Alum, 226, 227. Dry or in solution, in simple or scarlatinal sore throat, in tonsillitis, and even diphtheria.
Gargles in chronic inflammations, but glycerine of tannin better.
Antimony, 288. One-quarter to one-half a grain of tartar-emetic every hour in tonsillitis.
Antiseptic solutions, 130. In sloughing.
Arsenic, 305. In medicinal doses in sloughing of throat or malignant sores.
Belladonna, 530. Internally in severe inflammatory diseases, especially when throat and tonsils acutely inflamed and much swollen—may be given with aconite.
Benzoin, compound tincture of, 422. As an inhalation in pharyngitis.
Borax, 180. In hoarseness from strain of voice.
Capsicum, 433. One drachm of the tinct. to half a pint of water as a gargle in some sore throats, and in the very early stage of tonsillitis and pharyngitis, also in malignant sore throat and in relaxed throat. (*See* Whitla's formula.)
Carbolic, 351. Spray to nose or gargle in contagious sore throat.
Cocaine, 600. Painting with a 20 per cent. solution in ulcerations of epiglottis. A 4 per cent. solution in tonsillitis repeated every hour relieves pain. Sometimes as spray. Caution.
Cold compress, 471. Used nightly to harden throat, when tendency to catarrh. It should be swabbed daily with glycerine of tannin. Inhalations of sulphurous or carbolic acid useful.
Creasote, 345. Or carbolic acid gargle in sloughs of throat.
Glycerine of tannin, 338. After acute inflammation; in ulceration in aphthous sore throat; in chronic inflammation; often when accompanied by deafness or cough, provided no cartarrh or phthisis or teething irritation.
Guaiacum lozenges, 463. In follicular pharyngitis, also in acute tonsillitis.
Hydrastis, 590. As a wash or gargle in catarrh of naso-pharynx.
Ice, 89. Very valuable, constantly sucked in tonsillitis, sore throat, etc.
—— 89. A poultice of broken ice in an indiarubber bag in tonsillitis, scarlet fever and diphtheria, especially when lymphatic glands much swollen.
Iodine, 134. Tincture injected into hypertrophied tonsils.
—— 136. Tincture applied locally to sores, whether syphilitic or not.
Iodoform, 396.
Ipecacuanha wine, 448. As spray in non-inflammatory sore throat and hoarseness from congestion of vocal cords.
Menthol, 415. As pigment.

THROAT, DISEASES OF—*continued.*

Mercury, 275. In acute tonsillitis when tonsils almost meet, the third of a grain of grey powder every hour beneficial even if an abscess has formed.
Mercury and morphia, oleate of, 260. In obstinate and painful tonsillitis.
Nitrate of potash, 220. Crystals sometimes sucked in acute inflammation, but other remedies preferable.
Nitrate of silver, 253. In early stage of inflammation locally applied may cut it short. Solutions are used in chronic sore throat, but generally tannin and other astringent but non-irritant applications better unless in a sloughing condition. Sometimes used in diphtheria on inflamed patches only. Sometimes applied to chronically inflamed larynx, as in phthisis, by brush or spray.
Sometimes injected into trachea in asthma, bronchitis, and phthisis.
Nitric acid, 162. Applied undiluted to foul sloughs.
Rhatany, 339. In relaxed states.
Salicylate of soda, 618. Extremely successful in quinsy.
Sulphides, 123. As natural waters, especially useful in follicular pharyngitis.
Sulphurous acid, 171. Inhalation, spray, or fumigation, for malignant sore throat, whether scarlatinal or otherwise; also tonsillitis, and clergyman's sore throat.
Tannin, 339. A spray of five per cent. tannin in diphtheria and croup.
Turkish baths, 76. In quinsies.
Zinc, sulphate of, 280. As gargle occasionally employed in relaxed throat.

THRUSH.

Borax, 180, 332. With honey or as glycerine of borax.
Boric acid, 174. With honey or glycerine.
Copper, sulphate of, 278. A weak solution to be painted over mucous membrane.
Glycerine, 332. Will sometimes cure.
Glycerine of borax, 332.
Salicylic acid, 613. One part (dissolved in alcohol) to 250 of water.
Sulphurous acid, 170. As solution, strong or diluted, locally applied.

TIC. (*See* NEURALGIA.)

TINEA CIRCINATA.

Acetic acid, glacial, 160.
Iodine applications, liniment, tincture, or ointment, 133.
Oils and fats, 321.

TINEA FAVUS.

Mercury, 258. A lotion of two grains of the bichloride in an oz. of water applied after each epilation.
—— 260. As oleate. (*See* Tinea sycosis.)
Oils, 320. To facilitate removal of scabs—poultices used also preparatory to epilation.
—— 321. Head to be greased freely to prevent spreading. Other members of family should also grease freely. A mild mercurial pomade or quinine in glycerine best.
Sulphurous acid, 170. The Pharmacopœia acid with glycerine. If the case is obstinate epilation assists.

TINEA SYCOSIS.
- MERCURY, 258. A lotion containing two grs. of the bichloride to an oz. of water to be applied after each epilation.
- —— 260. The five per cent. solution of oleate in oleic acid with the addition of an eighth part of ether.

TINEA TARSI.
- BLISTERS, 110. To temple, frequently repeated in obstinate cases.
- MERCURY, 257. The irritant ointments. Eyelashes to be cut short and ointment applied night and morning after picking off scabs. Ung. hydrag. nit. should not be diluted to more than half its strength. Sometimes best undiluted.
- —— 260. As oleate. (*See* Tinea sycosis.)
- SILVER, NITRATE OF, 252. Solid in obstinate cases after removal of scabs.
- SULPHATE OF COPPER, 277. As nitrate of silver, but milder.

TINEA TONSURANS.
- ACETIC ACID, 160. Strong, locally.
- CROTON OIL, 330. Liniment applied with brush, followed by poultice.
- IODINE, 133. Two drachms with an oz. of oil of wood tar, as a local application.
- GLYCERINE OF CARBOLIC ACID, 350. In early stages.
- MERCURY, 258. As lotion. (*See* Tinea favus.)
- —— 260. As oleate. (*See* Tinea sycosis.)
- OILS, 320. (*See* Tinea favus.)
- SULPHO-CYANIDE OF POTASSIUM, 553. Half an ounce with one ounce glycerine and seven ozs. of water as lotion. (*See* ref.)
- SULPHUROUS ACID, 170. (*See* Tinea favus.)
- TURPENTINE, 417. Followed by iodine. (*See* ref.)

TINEA VERSICOLOR. (*See* PITYRIASIS VERSICOLOR.)

TOE-NAIL, INGROWING.
- POTASH, 179. Cotton-wool kept moist with liquor potassæ pressed down between nail and soft parts.

TONGUE, PSORIASIS OF. (*See* PSORIASIS.)

TONGUE, CIRCULAR RASH ON.
- ARSENIC, 292.

TONSILLITIS (*See also* THROAT, DISEASES OF.)

TONSILS, ENLARGEMENT OF.
- COLD, wet compress, in enlargement during and after scarlet fever, 57. (*See* Scarlet fever.)
- IODINE INJECTIONS, 134.
- GLYCERINE OF TANNIN, 338.

TOOTHACHE. (*See* TEETH, AFFECTIONS OF.)

TORTICOLLIS.
- CAPSICUM, 432. A handful of the crushed pods are infused for 36 hours in a pint of hot or cold water and applied on lint covered with gutta percha.

TORULÆ. (*See* SARCINÆ.)

TUBERCULOSIS. (*See* PHTHISIS.)
- ARSENIC, 309. Appears to reduce temperature, and is perhaps beneficial in many ways.
- TUBERCULIN, 657.

TUMOURS.
- CHLOROFORM, 374. In diagnosis of abdominal tumours, also in that of phantom tumours.

TYMPANITES.
- TURPENTINE, 418. In conditions of severe prostration with tympanites.

TYMPANUM, RUPTURE OF. (*See* EAR, DISEASES OF.)

TYPHLITIS.
- ICE POULTICE, 88. To right side of lower part of abdomen.
- OPIATES, 557.

TYPHOID FEVER. (*See also* FEVERS.)
- ALUM, 228. For the diarrhœa.
- CHLORAL, 381. Opium better.
- CHLORINE INTERNALLY. DR. BURNEY YEO'S FORMULA, 131.
- COLD BATH, AFFUSION, PACKING AND SPONGING. (*See* 60, 61.) Hæmorrhage or peritonitis contra-indicate, 64.
- COLD COMPRESSES OR PACKING, 57.
- DIGITALIS, 485. Recommended by Wunderlich to lower temperature and slow the pulse, 488.
- ERGOT, 587. For intestinal hæmorrhage, hypodermically if urgent.
- HYDROCHLORIC ACID, 167.
- ICE POULTICE, 88. To right side of lower part of abdomen.
- LEAD, 245. The acetate with opium for the purging.
- LIME CARBONATE, 204. As chalk mixture.
- MERCURY, 273. Corrosive sublimate, the hundredth of a grain, every two or three hours for the diarrhœa. (*See also* 277.)
- —— 276. To disinfect stools.
- —— 275. Calomel, in small doses at commencement, not to be pushed so as to touch the gums.
- NAPHTHALENE AND β-NAPHTHOL, 625.
- OPIUM, 558, 561. In small doses at night for wakefulness with delirium, and also for the diarrhœa. (*See also* 499.)
- —— 558. May be given as injection for diarrhœa.
- QUININE, 610. To reduce temperature.
- SALOL, 619. Also as intestinal antiseptic.
- SERUM TREATMENT, 656, 657.
- STRYCHNINE, 577. In heart failure.
- SULPHUROUS ACID, 171.
- TURPENTINE, 417. In five to ten drop doses frequently repeated for hæmorrhages; and in ten min. doses every two hours in the advanced stage with a dry tongue; or drachm doses every six hours may be given when tympanites and prostration but without diarrhœa. (*See also* 4.)
- VERATRUM VIRIDE, 452. Has been employed.

TYPHOID STATE. (*See* EXHAUSTION.)

Typhus fever. (*See also* Fevers.)
- Alcohol, 362. Give early.
- Antimony, 288. In the delirium with wakefulness—tartar-emetic combined with opium. (*See* Fever.)
- Belladonna, 530, 537. Said to clean the tongue, and control delirium.
- Chloral, 381. To produce sleep and allay violent delirium.
- Cold bath, affusion, etc., 62.
- Musk, 429.
- Opium, 561. For sleeplessness.
- Quinine, 610. To reduce temperature.

Ulcers. (*See also* Sores.)
- Chlorate of potash, 222. In solution as a wash to clean and stimulate foul ulcers—other remedies better.
- Cinchona, 604. The powdered bark dusted over foul, indolent, sloughing and gangrenous ulcers promotes the healing process.
- Conium, 498. Locally applied by means of a poultice, will ease the pain and improve the character of the sore.
- Glycerine of tannin, 338.
- Nitric acid, 160, 161. Locally to destroy foul, unhealthy surface. As lotion to indolent and painful ulcers.
- Silver, nitrate of, 250. Applied to unhealthy ulcers. Also to ulcers of mouth.

Uræmia. (*See* Bright's disease.)

Urethra, catheterisation of, etc.
- Cocaine, 601. Caution in use of.

Urethritis. (*See also* Gonorrhœa *and* Gleet.)
- Boroglyceride, 174. As injection.
- Cocaine, 601.

Uric acid, excess of, in urine.
- Alkalies, 184, 190. Citrates are best.
- Magnesia, 199.
- Piperazine, 665.

Urine, decomposition of.
- Boric acid, 174.
- Salol, 619.
- Sulphites, 172.
- Sulpho-carbolates, 352.

Urine, incontinence of. (*See* Incontinence.)

Urine, suppression of.
- Copious injections, 99. Beneficial in some cases.

Urticaria. (*See* Pruritus.)
- Acids, 161. Diluted as washes.
- Alkalies, 176.
- Benzoic acid, 422. In eau de Cologne.
- Benzoin, 422. The comp. tinct. painted on the skin for itching.
- Chloroform, 365. As ointment to allay itching.
- Colchicum, 458. In gouty persons.
- Cyanide of potassium, 551. Or hydrocyanic acid. (*See* Itching.)
- Lead, 243. Lotions to ease itching.
- Salicylic acid, etc., 614.
- Warm baths, 67.

Uterine diseases. (*See also* Prolapse of uterus, Menorrhagia, etc.)
- Actæa racemosa, 465. To prevent miscarriages in irritable uterus and prolapsus.
- Belladonna, 529. With tannin and suppository in neuralgia of uterus.
- Camphor, 412. A saturated solution in eau de Cologne to be rubbed into the head for drowsiness or headache of uterine origin.
- Carbolic acid, 351. A weak solution as injection in cancer, etc.
- —— 351. Pure in ulcer of os and cervix and chronic inflammation of uterus or cervix. (*See* ref.)
- Carbonic acid gas, 115. Injected up vagina for pain of ulceration of os, cancer and neuralgia of uterus.
- Caustic lime, 201. Mixed with caustic potash as escharotic in affections of neck of uterus.
- Chloroform, 365. As spray in cancer, ulceration of os, and neuralgia; must be continued some minutes.
- Ergot, 588. Hypodermically for fibrous tumour.
- —— 588. The most valuable medicine known for uterine hæmorrhage—must be given in full doses and repeated every hour or so. Dry cupping over the sacrum useful, perfect rest necessary.
- Glycerine, 333. In congested neck of womb a pledget of cotton-wool saturated with glycerine and applied for several hours will induce a copious discharge of serum which will give as much relief as leeches,—a piece of twine should be fastened to it.
- Glycerine of tannin, 337. Checks discharge and stench of cancer, better still if mixed with glycerine of carbolic acid.
- Hydrastis, 589. In hæmorrhage from fibroids, etc.
- Iodoform, 396. As bolus with cocoa fat inserted into excavation produced by cancer.
- Iron perchloride, 230. Injected in uterine catarrh.
- Lead, 244. As plaster for pain in back due to uterine disease.
- —— 249. Internally in uterine hæmorrhage.
- Opium, 558. An injection into the rectum of laudanum and starch will subdue the pain of uterine diseases.

Uterine hæmorrhage. (*See* Hæmorrhage, post partum.)

Vaccination.
- Aconite, 474. For erysipelatous redness after vaccination. This treatment may be supplemented by the local application twice daily of belladonna ointment.
- Menthol, 416.

Vagina, diseases of. (*See also* Vulvitis.)
- Boric acid, 173.
- Boroglyceride, 174. As injection in vaginitis.
- Cocaine, 601. Suppositories and pessaries in painful conditions. A lotion relieves vaginismus. Caution.
- Glycerine of tannin, 337. In chronic vaginitis of children.

VARICOCELE.

Cold douche, 74. To perinæum and buttocks, with suspension of testicles in cold water.
Hamamelis, 342.

VERTIGO, AURAL.

Gelsemium, 522. The tincture in 10 min. doses thrice daily.

VOMITING.

Acids, 199.
Alcohol, 356.
Alum, 227. In six to ten gr. doses in obstinate vomiting of phthisical patients excited by coughing. In vomiting of whooping cough, 228.
Arsenic, 290. One drop of liq. arsen. before food in vomiting of drunkards, also in chronic vomiting without pain or nausea, has been recommended in vomiting of cholera, also in vomiting of pregnancy.
Bicarbonate of soda, 203. Half-drachm to a drachm to a pint of milk for infants, especially if constipated. If lime-water and bicarbonate of soda both fail, stop all milk, and feed on sopped bread, water gruel and chicken or veal broth.
Bismuth, 240. In many forms of vomiting in children, especially when due to acute or chronic catarrh of the stomach. Also salicylate of bismuth, 242.
Bromides, 157.
Carbolic acid, 352.
Carbonic acid water, 116. With milk.
Chloral, 383. In pregnancy.
Chloroform, 366. In drop doses, pure, in sea-sickness and other vomiting.
Cocaine, 602.
Counter-irritation, 110. At epigastrium often allays pain and obstinate vomiting due to diseases of stomach.
Creasote, 345. In sea-sickness, pregnancy, cancer, ulcer of stomach, and Bright's Disease.
Eucalyptus, 426. When sarcinæ.
Gelatine, 203. With milk, cream, and arrowroot, as food for young children. (*See* ref.)
Hydrocyanic acid, 552. Sometimes checks vomiting as well as relieves the pain of chronic ulcer, cancer, chronic gastritis, gastralgia, etc.
Ice-bag, 88. To epigastrium for pain and vomiting of cancer, etc.
Ipecacuanha, 199. In sympathetic vomiting.
—— 439, 440. In pregnancy (*see* ref.) and during suckling at menstrual times; in the morning vomiting of drunkards, but here arsenic generally better. In morning vomiting from weakness and in convalescents, in acute catarrh of the stomach in children — may be combined with aconite if inflammation great; in whooping cough—here sometimes alum better. In the vomiting occurring without nausea immediately after meals—here arsenic better. Sometimes in vomiting from cancer, 441.
Lime-water, 202. In chronic forms, as from chronic ulcer, mixed with milk—if vomiting incessant, patient should be fed on this only in frequent small quantities. Milk with one-eighth of lime-water often sufficient for infants in whom the gastric juice coagulates the milk causing vomiting, wind and colic. If constipation, bicarb. of soda better. (*See* above.) Withhold milk if necessary. (See 203.)

VOMITING—*continued.*

Magnesia, 199. In sympathetic vomiting, *e.g.*, of pregnancy—effects very transient.
Menthol, 416.
Mercury, 267. As calomel, or better still, grey powder, one-third grain every two hours in the sudden forcible vomiting of children. Small doses frequently given are useful when vomiting accompanied by clayey stools.
Milk, 204. Vary quality of; humanised milk.
Morphia, 565. Hypodermically in pregnancy as well as other severe forms. Often arrests persistent hiccup.
Nitro-glycerine, 409.
Nutrient enemata, 100. In persistent vomiting.
Nux vomica, 572. When tongue coated with thick fur—may be given with ipecac.
Oxalate of cerium, 199. One grain every three hours in sympathetic vomiting.
Quinine, 199. In sympathetic vomiting.
—— 611. Sometimes useful in vomiting of pregnancy.
Silver Nitrate, 254.
Spinal ice-bag, 92. In pregnancy and sea-sickness.
Veratrum album, 453. In vomiting and purging of summer diarrhœa.

VULVA, ECZEMA OF. (*See* ECZEMA.)

VULVA, PRURIGINOUS AFFECTION OF. (*See* PRURITUS.)

VULVITIS.

Alum, 225. A lotion, or if inflammation higher up an injection, of sixty grains to a pint of water, to be used every hour or oftener. This strength is occasionally too much.
Glycerine of tannin, 337. In chronic vaginitis of children.
Lead, 243. Solutions of the acetate or diacetate as wash when acute stage just subsided—later on stronger astringents needed.
Lime-water, 202. As a wash.

WARTS.

Arsenic, 289. Arsenious acid as a caustic—enough to be used to excite active inflammation. (*See* ref.)
—— 290. Liquor arsenicalis may be painted over warts.
Bichromate of potassium, 224.
Caustic alkalies, 175. Undiluted or mixed with caustic lime, locally.
Chromic acid, 172. A solution of 100 grs. to one oz., applied with a glass rod so as just to saturate the diseased growth, any superfluous acid to be removed; dress with dry lint.
Glacial acetic acid, 160. Very effectual.
Mercury, nitrate of, 256. Locally applied.
Nitric acid, 160. A drachm or two of the dil. acid to a pint of water, as a wash to keep small syphilitic warts and condylomata constantly moist.
Salicylic acid, 614.
Silver, nitrate of, 250. As caustic, but too superficial.
Zinc, 279. Chloride, iodide and nitrate locally.

WASTING DISEASES.

Oils and fats, 320.
Phosphate of lime, 207. In chronic cases.

WHEEZING.

Arsenic, 298. In emphysematous persons —(*See* Emphysema). In the wheezing of children with oppressed breathing.
Tartar emetic, 287.

WHITE SWELLING.

Iodine, 134. A solution injected into the joint.

WHITLOW.

Antimony, 288. As tartar emetic. (*See* Inflammation.)
Carbolic acid, 349. To benumb the surface during incision.

WHOOPING-COUGH.

Alum, 228. When acute stage is over and there is no complication two to six grs. every three hours, or less every hour, in glycerine or honey.
Belladonna, 536. Especially during third week. Children bear this drug well; ten minims of the tinct. may be given hourly to a child two or three years old, 478.
Of little use if complications exist.
Bromide of potassium, 148, 149, 152. Especially in summer. When uncomplicated, except with convulsions.
Cannabis indica, 584. Has been found useful.
Carbolic acid, 344, 353.
Carbonate of potash, 185. In one or two grain doses.
Chloral, 382.
Chloride of ammonium, 211.
Chloroform, 365. Or ether, to lessen violence of paroxysms.
Clover, 582. A wineglassful occasionally through the day of an infusion made of two ounces of carefully dried red blossoms steeped in a pint of boiling water for four hours.
Cocaine, 603.
Cod-liver oil, 326. In middle and after stage.
Conium, 501.
Ergot, 589. Said to be useful.
Gelsemium, 523.
Grindelia, 523.
Ipecacuanha, 440, 449. Useful in many cases.
Lime-water, 205. Useful from its astringency, as in some forms alum and tannin advantageous.
Lobelia, 582. In spasmodic stages. Children very tolerant of this drug; for a child two years old, ten min. of the tinct. every hour and an additional dose each time the cough is imminent provided the paroxysm gives sufficient warning.
Musk, 429. Has been given.
Mustard, 431. Said to be useful.
Opium, 567. In convulsive stage. Sufficient should be given to produce slight heaviness, which should be maintained. (*See* ref.)
Quinine, 605.
Senega, 642. Given by some.
Silver, nitrate of, 253. A solution for sponging out throat or as spray. As spray when patient more than two or three years old.

WHOOPING-COUGH—*continued.*

Tannin, 339. Applied to throat.
Valerian, 427. Preparations said to control paroxysms.
Zinc, 282. As oxide or sulphate.

WORMS.

Alum, 640. As solution for injection.
Areca nut, 639. For tape worm.
Bromide of potassium, 150. In convulsions caused by worms.
Chloride of ammonium, 211. To prevent formation of thick mucus which serves as nidus for worms.
Chloroform, 375. For tape worm.
Colocynth, 629. As purgative.
Common salt, 640, 641. Chloride of ammonium and antimony to remove catarrhal state of mucous membrane.
Eucalyptol, 426. Injection for thread worms.
Filix mas, 638. For tape worm, to be taken on an empty stomach and followed by a purge. (*See* ref. for directions.)
Injections, 100. For thread worms; enough liquid should be used to reach a little higher than the rectum. Half a pint enough for an adult. Solution of salt, iron, etc., must not be too concentrated lest inflammation ensue.
Iron, 230, 640. Tinct. ferr. sesquichlor. half an ounce in a pint of water, a good injection for thread worms, coagulating albumen.
Kamala, 639. For tape worm.
Kousso, 638. For tape worm.
Lime-water, 204 and 640. As injection for thread worms.
Naphthalene, 625.
Oils, 641. Reputed vermicides.
Pelletierine, 639. The tannate in tape worm.
Punica granatum, 638. As infusion for tape worms.
Quassia, 627, 640. The infusion useful for ascarides, as injection or by mouth.
Santonin, 639. For round and thread worms, in castor oil by mouth or as an injection or suppository.
Scammony, 632. For thread worms in the rectum.
Tannin, 340. As catechu, kino, red gum, rhatany, hæmatoxylum, in injections to destroy thread worms.
Tonics, 641. As cod-liver oil and iron to restore intestinal canal to healthy condition.
Turpentine, 418. As poison to tape and threads worms. (*See also* 639.)
Valerian, 427. Especially when convulsions.

WOUNDS.

Aloes, 629. Topically as a slight stimulant —often purges.
β-Naphthol, 625. In unhealthy wounds.
Boric acid, 173. Antiseptic dressing.
Carbolic acid, 348, 349. Locally.
Collodion, 317. Paint over to adjust edges and exclude air.
Hamamelis, 341. On lint or cotton-wool when oozing from wound.
Ice and salt, 90. Applied to wound prevents inflammation.
Iodoform, 396.
Iodol, 399. Cleans gangrenous wounds.
Naphthalene, 625. In unhealthy wounds.
Opium, 557. To quiet intestinal movements in wounds of the abdomen.
Salicylic acid, etc., 613.

WOUNDS—*continued.*

SULPHUROUS ACID, 170. Solution constantly applied, diluted or not.
TANNIN, 338. Or glycerine of tannin to coat over wounds.
TURKISH BATH, 76. For pain in the seat of old wounds.

XERODERMA.

GLYCERINE, 332. Glycerine of starch to be rubbed in daily after a bath.
OILS AND FATS, 320. In conjunction with warm baths to lubricate skin.
VASELINE AND PETROLEUM, 335.

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